[COMMITTEE PRINT]

SYMPOSIUM ON MINORITIES AND WOMEN IN SCIENCE AND TECHNOLOGY

A REPORT PREPARED

BY THE

SUBCOMMITTEE ON
SCIENCE, RESEARCH AND TECHNOLOGY

TRANSMITTED TO THE

COMMITTEE ON
SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
NINETY-SEVENTH CONGRESS

SECOND SESSION

Serial AA

JULY 1982

Printed for the use of the Committee on Science and Technology

U.S. GOVERNMENT PRINTING OFFICE
91-931 O WASHINGTON: 1982

H702-14

COMMITTEE ON SCIENCE AND TECHNOLOGY

DON FUQUA, Florida, *Chairman*

ROBERT A. ROE, New Jersey
GEORGE E. BROWN, Jr., California
JAMES H. SCHEUER, New York
RICHARD L. OTTINGER, New York
TOM HARKIN, Iowa
MARILYN LLOYD BOUQUARD, Tennessee
JAMES J. BLANCHARD, Michigan
TIMOTHY E. WIRTH, Colorado*
DOUG WALGREN, Pennsylvania
RONNIE G. FLIPPO, Alabama
DAN GLICKMAN, Kansas
ALBERT GORE, Jr., Tennessee
ROBERT A. YOUNG, Missouri
RICHARD C. WHITE, Texas
HAROLD L. VOLKMER, Missouri
HOWARD WOLPE, Michigan
BILL NELSON, Florida
STANLEY N. LUNDINE, New York
ALLEN E. ERTEL, Pennsylvania
BOB SHAMANSKY, Ohio
RALPH M. HALL, Texas
DAVE McCURDY, Oklahoma
MERVYN M. DYMALLY, California

LARRY WINN, Jr., Kansas
BARRY M. GOLDWATER, Jr., California
HAMILTON FISH, Jr., New York
MANUEL LUJAN, New Mexico
HAROLD C. HOLLENBECK, New Jersey
ROBERT S. WALKER, Pennsylvania
EDWIN B. FORSYTHE, New Jersey
WILLIAM CARNEY, New York
MARGARET M. HECKLER, Massachusetts
F. JAMES SENSENBRENNER, Jr., Wisconsin
VIN WEBER, Minnesota
JUDD GREGG, New Hampshire
RAYMOND J. McGRATH, New York
JOE SKEEN, New Mexico
CLAUDINE SCHNEIDER, Rhode Island
JIM DUNN, Michigan
BILL LOWERY, California

HAROLD P. HANSON, *Executive Director*
ROBERT C. KETCHAM, *General Counsel*
REGINA A. DAVIS, *Administrator*
GERALD E. JENKS, *Minority Staff Director*

SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY

DOUG WALGREN, Pennsylvania, *Chairman*

GEORGE E. BROWN, Jr., California
BOB SHAMANSKY, Ohio
MERVYN M. DYMALLY, California
STANLEY N. LUNDINE, New York
ALLEN E. ERTEL, Pennsylvania
RALPH M. HALL, Texas
DAVE McCURDY, Oklahoma

MARGARET M. HECKLER, Massachusetts
VIN WEBER, Minnesota
JUDD GREGG, New Hampshire
JOE SKEEN, New Mexico
EDWIN B. FORSYTHE, New Jersey

---

*On assignment to Budget Committee for 97th Congress.

CONTENTS

	Page
Panel discussion No. 1: Dr. Cora Marrett, professor, Department of Sociology, University of Wisconsin; Dr. Alvin Rivera, director, National Institute for Resources in Science and Engineering; Dr. Robert Suzuki, dean, graduate studies and research, California State University, Los Angeles, California; Dr. Arnold Anderson, executive director, American Indian Science and Engineering; Dr. Michelle L. Aldrich, director, Project on Women in Science, American Association for Advancement in Science (AAAS)	4
Panel discussion No. 2: Dr. Lloyd Cooke, president, National Action Council for Minorities in Engineering (NACME); Dr. Constance Tate, coordinator of science, Baltimore public schools, Baltimore, Maryland; Dr. McKinley Nash, assistant superintendent, Evanston Township High School, Evanston, Illinois; Dr. Melvin Webb, deputy director, Resource Center for Science and Engineering, Atlanta, Georgia	24
Panel discussion No. 3: Dr. Allen Rosenstein, professor, engineering, UCLA; Dr. Sheila Pfafflin, human resource research, A.T. & T.; Charles Hughes, Bell Telephone Laboratories; Dr. Carl Spight, vice president for corporate research, AMAF Industries, Inc.; Arthur D. Rogers, private business consultant for Science, Technology & Innovative Enterprises; Melvin Thompson, senior policy analyst, NSF; Dr. James Lawson, chief, University Affairs Office, NASA; Dr. Thomas Moss, staff director, U.S. House of Representatives, Subcommittee on Science, Research and Technology, Science and Technology Committee	46
Panel discussion No. 4: Dr. Jewel Cobb, dean, Douglas College, New Brunswick, New Jersey; Dr. Benjamin Chavis, doctor of ministry, Howard University, Washington, D.C.; Dr. David Johnson, congressional fellow, American Association for the Advancement of Science (AAAS), Washington, D.C.; Dr. Betty Rosenstein, educator and consultant, Los Angeles, California	67

LETTER OF TRANSMITTAL

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
Washington, D.C., July 21, 1982.

Hon. DON FUQUA,
Chairman, Committee on Science and Technology,
U.S. House of Representatives.

DEAR MR. CHAIRMAN: As you know, the underrepresentation of minorities and women in science and technology has been a subject of particular concern to the Subcommittee on Science, Research and Technology. As we have considered issues related to the competitive strength of our national scientific and engineering manpower, it is clear that we cannot afford the wasteful exclusion of minorities and women from that talent pool. This perception led to the Subcommittee's work with its Senate counterpart to enact the Science and Technology Equal Opportunities Act of 1980.

The attached proceedings, "Minorities and Women in Science and Technology," is a record of a symposium held by the Congressional Black Caucus to review the implementation of this Act and issues related to it. I am grateful to Congressman Mervyn M. Dymally of our Subcommittee for taking the leadership role in organizing this meeting on a subject so important to our work. The ideas of the speakers and participants will help guide us toward the most effective approaches in future activities.

DOUG WALGREN,
Chairman, Subcommittee on Science,
Research and Technology.

SYMPOSIUM ON MINORITIES AND WOMEN IN SCIENCE AND TECHNOLOGY

FRIDAY, SEPTEMBER 25, 1981

The meeting was convened at 9:20 a.m. by Hon. Mervyn M. Dymally, moderator.

Representative DYMALLY. Good morning. First let me welcome you all here and thank you for coming.

My name is Mervyn Dymally. I am a member of the Committee on Science and Technology and the chairman of the Congressional Black Caucus, Committee on Science and Technology. I express my thanks to all of you who helped in putting this seminar together.

It is my pleasure to introduce to you the chairman of the House Committee on Science and Technology, Congressman Don Fuqua.

Representative FUQUA. Thank you very much. We appreciate your efforts in bringing about this meeting on science and technology.

First, I want to say that I am very pleased to be here with you this morning. The ideas of distinguished panelists will be very valuable to myself and our congressional colleagues.

We will certainly value your advice on how we can be more effective in insuring that we are tapping the talent of all of our people and using the tools of science and technology.

I am very grateful to my friend and colleague on the Committee on Science and Technology, Mervyn Dymally, for taking the leadership role in facing this issue. At a time when we face major challenges in energy, environment, and in achieving a decent economic position for all of our citizens, we need all the science talent we can muster.

In recent years, minorities other than Asian Americans received only 2.2 percent of the science and engineering doctorates, and held only 1.3 percent of science and engineering jobs, though they constituted over 17 percent of all the employed persons. Women have been in a similar position. They make up 40 percent of the work force, but only 8 percent of scientists and engineers. Society simply cannot afford to waste this valuable talent.

Seeking equal opportunity in science and engineering for minorities and women is not something that we should do just to be fair to minorities and to women. It is for the good of our entire Nation and for our technological strength. Congressman Dymally and I and our subcommittee ranking minority member, Margaret Heckler, from

Massachusetts, have been strongly interested in the implementation of the Science and Technology Equal Opportunities Act, which we enacted into law last year.

It provides a broad base for a strong congressional mandate to the National Science Foundation to make this effort a high priority. I think that under the leadership of Dr. Slaughter and some of the distinguished science board members of the Foundation, such as Dr. Cook, who is here today, NSF has welcomed this mandate.

NSF is wisely avoiding making equal opportunities the concern only of an isolated office or administrative unit, and are trying to make it an important goal pervading all of the Foundation's activities. Of course, there are constraints. I need not tell you what problems we are having, particularly after last evening's speech about funding.

We can address this area in many ways, but we would certainly be fooling ourselves if we thought even the best efforts of Don Fuqua or Mervyn Dymally or Margaret Heckler and John Slaughter could squeeze a vast flow of new funds out of OMB.

But we are going to work at it. Only this week we have had to struggle to defend even the funds that exist against proposed cuts on the House floor. We were successful in the vote on the NSF authorization on Wednesday, but it still is a continuing struggle.

We are going to put faith and reliance in the leadership and the inventiveness of Dr. Cora Marrett in her role as chairman of the NSF Equal Opportunities Committee. We are very fortunate to have a person of her caliber and I will personally try to be as supportive as possible in the endeavors that she undertakes. I hope that the ideas and discussions here today will be helpful to her and to the committee. I know that it will certainly be very helpful to me.

You have my best wishes and keen attention to the ideas that you are generating here today. I want to thank you for the opportunity of being here and having a chance to participate in these opening remarks. Thank you very much. [Applause.]

Representative DYMALLY. May I ask the moderator, Dr. Snyder, and the panelists to come up here, please, Dr. Marrett, Dr. Rivera, Dr. Suzuki, Dr. Anderson, and Dr. Aldrich.

Of some significance I think to all of us is the fact that we are in the Hubert Humphrey Building. If he were here today, I could just hear him say, "Gee, Merv, this is a great gathering." After introducing the panel, he would spend 4 hours talking. [Laughter.]

I want to introduce our moderator. Dr. Snyder for several years worked on surveys of U.S. Ph. D. candidates; studies which were conducted by the National Academy of Sciences. She was coauthor with Dorothy Guilford of *Women and Minority Ph. D.'s in the 1970's*. We are pleased to have Dr. Snyder, an associate of the National Subcommittee for Education. Dr. Snyder?

Dr. SNYDER. Good morning. We have been asked to say a few words and I will try to keep them few and leave the time for our panelists. Unfortunately, I have to remind them that they have approximately 9 minutes each. Let's try to stick to that so that we have adequate time for audience participation later.

The problems of science that have been mentioned, I will simply allude to a couple of times because they present the backdrop against which we have to come to grips: the shortage of scientists in certain areas; the need to bring in all the manpower possible to fill shortages we see; and the need to grapple with the problems that are present.

In recent years, there has been a question as to whether the United States has been keeping up with the scientific productivity of other nations. Actually, we are still ahead, but it appears that other countries are gaining on us in scientific productivity as measured by such indicators as publication of scientific literature, and inventiveness as measured by patents.

There are new problems now emerging for science and technology in the United States. One of these is the question of research productivity of faculty. In this country, much of the basic research has been conducted in the universities and we now have universities in which high proportions of the faculty are tenured leaving little room for new faculty to enter with new ideas and the latest training.

Various measures have been proposed to deal with this. Special research leaves for faculty members so that their places can be taken, at least temporarily, by new and younger researchers. Despite this, the prospect of fewer academic jobs for younger faculty members, there are still areas in science and technology of tremendous shortage.

For example, in computer science and in the engineering fields very few graduates are staying to go on to advanced degrees to become the faculty members of future generations.

This is particularly critical in engineering. This week a series of awards was announced by Exxon to encourage individuals to stay, go on to graduate school, and complete advanced degrees, and also to compensate younger faculty members who probably earn less at present in academia than in industry.

So looking at these fields in particular, computer science and engineering where there are tremendous shortages, the question has to be posed of the possible roles for those who have been underrepresented in science and technology. Given the shortages in these fields, one of the startling facts to be pointed out is the very high proportion of foreigners who are obtaining advanced degrees in these fields.

Last year, for example, 46 percent of the Ph. D.'s in engineering went to foreigners. We don't know much about them. Do they stay? Do they go? What do they contribute to this country? How many of them will engage in teaching? Certainly given that high proportion, we have to be concerned with the underrepresentation of minorities and women in scientific fields.

Now I would like to turn to our speakers. The first one, Dr. Cora Marrett, is professor of sociology at the University of Wisconsin. Her interests are exceedingly broad, but among other things they have included the study of women in science and engineering. Some years ago I began work on studies of Ph. D.'s and I ran across an extremely helpful article. I am very glad to finally meet the author who produced the article entitled "Women In Science and Engineering." Dr. Cora Marrett.

91-931 O - 82 - 2

STATEMENT OF DR. CORA MARRETT, PROFESSOR, DEPARTMENT OF SOCIOLOGY, UNIVERSITY OF WISCONSIN; DR. ALVIN RIVERA, DIRECTOR, NATIONAL INSTITUTE FOR RESOURCES IN SCIENCE AND ENGINEERING; DR. ROBERT SUZUKI, DEAN, GRADUATE STUDIES AND RESEARCH, CALIFORNIA STATE UNIVERSITY, LOS LOS ANGELES, CALIF.; DR. ARNOLD ANDERSON, EXECUTIVE DIRECTOR, AMERICAN INDIAN SCIENCE AND ENGINEERING; AND DR. MICHELLE L. ALDRICH, DIRECTOR, PROJECT ON WOMEN IN SCIENCE, AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE (AAAS)

Dr. MARRETT. Thank you. I will keep my remarks brief because in large part today I am here to learn. I would like to hear whatever suggestions and ideas people are bringing with them especially for the Committee on Equal Opportunity in Science and Technology of the National Science Foundation.

There are two major points I would like to make. One is that we need to balance a discussion of what I would call the epic figures in science against the discussion of underrepresentation. My second point is that we need to be concerned about scientific literacy as well as about increasing numbers of scientists and engineers when we talk about the minority communities.

Let me turn to the first point, the need for balancing a discussion of stardom against a discussion of underrepresentation. There have been essentially two approaches if we look at the work, especially on black scientists and engineers.

The first approach, which I would call the heroic approach, has been the one that in the past always cited George Washington Carver when there was a discussion of blacks in science. More recently, Carver has been replaced by Charles Drew.

The alternative approach has looked not at the stars at all, but at the figures citing the underrepresentation, the absence of blacks in science and engineering. It seems to me that there are problems if we don't seek to balance those two approaches. One of the first problems with the kind of start or heroic approach is that that kind of approach does not serve very well to stimulate interest on the part of young blacks and other members of other minority groups.

And I am particularly concerned about the matter of getting more people into the pipeline. The problem with a star approach is that such individuals, such stars, do not serve as effective role models. It is fairly difficult for contemporary youth to identify very heavily with George Washington Carver, for example.

Thus, while that kind of approach is interesting, and it is inspirational in a number of respects, it does not often serve as a good spur to action.

The other problem, it seems to me, with both the star approach and the underrepresented approach, is that neither approach takes into account the contributions being made by so many contemporary black scientists and engineers. Thus it seems unfair not to acknowledge the work that still goes on in any number of different sectors.

Moreover, if we gave more attention to those people who are still undertaking work, still pushing back the frontiers of knowledge, it seems that there are possibilities for inspiration there because it is there

that we can begin to give students a sense of what it is like, of what the discovery is all about. It is possible that by using more effectively people who have become involved then they become the ones who spur others to action. It seems to me, then, that what we need to do is both describe under-representation, and also talk about the role models, the success stories.

It seems to me that is the kind of balance that we need to have continually. We need to acknowledge the stars, undoubtedly.

But we need, too, to think of ways to present the information so that it does make a difference for generations to come.

Now with reference to the matter of underrepresentation, the matter of the problems of participation in science and engineering, one of the major questions is always why should there be any concern? Well, it seems to me that we should be concerned for a number of reasons.

First, there is the need to expand the pool of scientists. There is the need to bring into science and engineering groups that are not at the present very healthly involved. This would be for a variety of reasons. One is the problem of what could be termed simply the wasted talent.

For the past couple of years I have been involved in research in a number of secondary high schools across the country and it has been very frustrating to see students with great potential who simply are not going to be going on to develop that potential. It seems that this is simply a waste of the individual abilities that do exist.

But beyond the matter of the waste of individual talent, we should be concerned because of the matter of what this Nation supposedly stands for and that is equality of opportunity.

If we are going to talk then, about why be concerned, we must think about what it means with reference to matters of equity. Finally, if we think about why be concerned, there is the matter of what our Nation needs, what it needs with reference to increased productivity, for example.

And thus, the need for expanding the pool of science and engineers is a matter that should not be of concern simply to the minority community. We need to expand the pool of scientists, and engineers, but there is another reason for being concerned about the underrepresentation of minorities, women, in science and engineering.

With reference to the minority community, there is a need for greater scientific literacy. There is a need beyond simply preparing people to enter the pool of science and engineering. We know that this is a society of increased technological sophistication. We know as well that there are developments on the forefront that are likely to have impact on communities with large concentrations of members of minority groups. If those individuals are to come to understand, to have an impact on, to influence in any way what is going on in their lives, obviously they are going to have to understand the kinds of developments that are taking place.

Thus, if there is concern with underrepresentation, it is in part to say we need a population of people who can make assessments, who

can understand, who can evaluate, who might not themselves always be the ones to undertake the discoveries, but they will be the ones who will know where to turn for expert advice.

They will feel comfortable in making some assessment about the quality of that advice. There is no question but in my mind the matter of increased representation should be a matter of general concern and should then be placed on any national agenda.

What I would hope we are going to be doing in the course of this discussion will be to identify mechanisms, structures, approaches, so that we don't simply identify the problems and then go on to respond by talking about the heroes.

We need instead to set up procedures, systems for using the information we have, for identifying other information, for developing ways so that we can monitor any kinds of concerns or developments which might be on the forefront that are likely to influence minority communities, but in the long run are going to influence the whole country.

Thank you.

Dr. MARRETT. Our next speaker is Dr. Alvin Rivera who is the director for the National Institute for Resources in Science and Engineering and the Washington, D.C. representative of the Society of Hispanic Professional Engineers. We actually did meet sometime ago when Dr. Rivera was one of a group of Hispanics who came to suggest that studies of Ph. D.'s should take into account different kinds of Hispanics.

I am not sure whether he knows that it has been done, and data is now being published on different kinds of Hispanic Ph. D.'s.

Dr. RIVERA. That is a very revealing finding. Sometimes when you do things, you never really realize the kind of impact that it is likely to have in the future.

I would like to talk today about a number of things. Initially, I think it would be a serious error not to recognize the important role of Congressman Dymally in making this opportunity available to us to talk about bringing minorities and women closer together and talk about issues in science and technology.

I think as we continue today, we are likely to hear more that there is a demand for trained engineers and scientists in our society and it is becoming indeed a national concern.

I would like to talk this morning about four things and I will try to keep them within the 10 minute-time span.

First, I would like to talk rather briefly about the participation of Hispanics in science and technology, the problems that limit their participation and to suggest some practical activities to solve these problems. Finally, I would like to talk about the need for Hispanics and other groups to work more closely together in the future, a survival strategy.

Initially let me talk quickly about Hispanic participation. I am sure that perhaps some of you know, the recent 1980 census revealed that Hispanics constitute 14.6 percent of the population, which is 5.6 percent of the U.S. population.

That does not include Puerto Rico. I think also an interesting finding was among Americans, 25 years and older, only 45 percent of His-

panics have completed high school compared with 51 percent of blacks and 71 percent of whites.

Hispanics receive less than 2 percent of all college degrees. Hispanics on the mainland constitute 1.7 percent and 1.4 percent of bachelor's and master's degrees respectively in engineering during the 1980's.

For that same period it is interesting to note that the enrollment of Hispanics in engineering was 2.5 percent of the total population enrolled in the field at that time. The information from another source on scientists is much the same type of pattern.

I don't want to belabor this particular point. I think it would suffice to suggest, however, that the Hispanic participation is quite limited in this field. I think there is something to say, however, about data sources. It is possible that the National Science Foundation can help in this regard.

I think it is probably safe to assert some of the following points: First, the collection of data on Hispanics is disjointed, fragmented and virtually lacking a plan for the utility of the information acquired.

Second, the information acquired on Hispanic scientists and engineers in many instances is presented in such a manner as to present the best possible picture and impression while, in fact, representing really a distortion of the reality of the situation.

I think there exists a need to continue to break out Hispanic subgroup populations which has been done with the Ph. D. data. I think there is a need also for timely data in all of the sciences regarding Hispanic participation and graduation. Such data should include statistics for all possible secondary years.

I was struck recently by something I had read that Betty Vetters put out. She had assembled some information on Hispanic participation in the sciences which conveyed some rather disappointing conclusions. Basically she had to say this:

> We know almost nothing about the makeup of various Hispanic groups within science, nor do the data generally provide breakout by sex and especially by sex and field within Hispanic populations. We can say with assurance that no segment of Hispanic population is represented in science or in the educational pipeline leading to science careers in as large a proportion as is represented in the U.S. population.

This is an extremely revealing finding.

I know many of you here probably are familiar with a lot of problems that Hispanics experience in accessing technical careers but I think it is important to summarize rather quickly. First, I will say that Hispanics basically lack interest, exposure, and motivation as students at an early age.

Second, this is due to the poor academic training that they receive in elementary and secondary education, in the school systems. Third, it is due to the insufficient financial support for science and engineering at all academic levels and insufficient financial aid to the respective students, to the lack of minority professional role models, and finally, it is due to the lack of historical institutions that focus on the mission of science and engineering that are Hispanic.

Basically these could probably be summarized in some concerns that talk about access, preparation and retention. I think pertaining to access, more emphasis needs to be stressed on exposing Hispanic

students in junior high and high school to career opportunities in the technical fields.

Both levels of education instruction need additional resources to do the job adequately for Hispanics. Pertaining to preparation; preparation of Hispanic youth for technical careers is vital. Yet such a carrer goal is very difficult to pursue. It requires a lot of effort, a lot of energy and a lot of dedication.

I think without encouragement from key sources within the school system, this is not likely to occur.

Finally, pertaining to retention, I think experience has demonstrated already that retention programs are very helpful support systems to insure the success of minority youth in technical careers. More emphasis should be generated in this particular area and it should be generated on a longitudinal basis. I think funding sources have to be very aware that this is not going to be a short-term kind of engagement. It is going to take a lot of time, a lot of energy, and a commitment over a long period of time.

Also, I think funding sources should be receptive to community based organizations and professional engineering societies that work in conjunction with colleges of engineering and the sciences to accomplish the goals cited. I would like to suggest some possible activities that have revealed some interesting contributions I believe in this entire area.

Let me cite just a few: Some summer enrichment programs and projects that focus on math and science for junior high school kids; summer jobs in industrial settings with supportive supervision; student projects and programs—that are supported by professional Hispanic engineering organizations; programs that encourage parental involvement in student's career choices; role model relationships developed through service organizations and cooperation with schools and universities; on-site student visits to the every day world of work of engineers and scientists; student to student peer support systems; and promotion of co-op educational programs at the high school and at college level.

I think continued support from private sources to private scholarship funds would encourage more engineers and scientists. Programs should be promoted that stress career day activities, to bring students and corporate representatives together. Finally, just developing leadership training programs which would assist students and practicing engineers to acquire leadership skills.

One of the things I have learned in my experience with the Society of Hispanic Professional Engineers is that we have many very capable young potential leaders and I stress young because they are young, perhaps younger than certainly 35, probably closer to 27 to 30.

They are very capable. They have many leadership skills. But they just need a little bit more experience.

I think the corporations can play a meaningful role in helping these young people acquire these necessary skills.

Let me say finally that Congressman Doug Walgren, the chairman of the Subcommittee on Science, Research, and Technology, recently indicated his concern about what appears to be happening in the whole area of science and technology.

He expressed basically that we may be moving into an era where only a small elite are functional participants in the technology-based society. He was expressing concern, further, that there appears to be a disenchantment that is likely to result in many people being disenfranchised from this entire effort, and particularly some of the more underserved populations.

I think this is a legitimate concern for us to think about here today. I think all disenfranchised groups will have to work more closely together in the future, to accomplish a common goal, which is to increase the representation of all groups in these fields.

We, as minorities, must make a point to learn about other groups that experience similar disenfranchised positions. Each group will need to trust each other more. To discuss this concept in the abstract is much easier than to know the realities that evolve from situations where groups are only interested in what they can gain for themselves.

Nevertheless, if the relationship of minority groups is based upon anything other than a sound foundation of trust, the results will rarely yield anything but a hollow victory.

Thank you. [Applause.]

Dr. SNYDER. Our next speaker is Dr. Robert Suzuki, recently named dean of graduate studies and research at California State University, Los Angeles. Originally, Dr. Suzuki came out of engineering with a Ph. D. in aeronautics, but he has moved beyond the confines of those fields to the fields of scientific and multicultural education and has been involved in issues of scientific and technical manpower.

He was long an activist on behalf of Asian Americans and for the past 10 years has published extensively on multicultural education and the special situation of Asian Americans.

Dr. SUZUKI. Thank you very much, Joan. I am very pleased that Congressman Dymally has invited me to join this panel today and given me the opportunity to present the perspective of an Asian/Pacific American.

We, too, in agreement with the previous speakers, believe that science and technology will continue to grow in importance in the years ahead, and that Asian/Pacific Americans, along with other groups, must be adequately educated in their fields.

In our increasingly technological society, knowledge of science and technology is essential for decisionmaking, for access to and interpretation of information, and for communication. It is also clear, as pointed out by Dr. Marrett, that a large share of the new job opportunities in the decades ahead will be in the fields of science and technology and that practically every job in the future will expose the worker to some form of technology. Thus, if minorities wish to gain parity and equity in this country, they clearly must make major inroads into the fields of science and engineering.

Some of you may be wondering why an Asian/Pacific American has been included on a panel discussing the underrepresentation of minorities and women in science and technology. There seems to be a widespread impression that Asian/Pacific Americans, if anything, are already overrepresented in science and engineering. And, furthermore, many people believe that Asian/Pacific Americans have been so successful in this society that they have very few problems to even speak of.

Well, let me suggest that the popular image many people have of Asian/Pacific Americans as the so-called "model minority" is more a myth than reality. In the very brief time I have today, I would like to try to correct some of the misconceptions people have of Asian/Pacific Americans and offer you an alternative and, I think, more balanced perspective on them.

I will do this by addressing four major questions. First, who are the Asian/Pacific Americans; that is, what ethnic groups are they comprised of, what are their numbers, and so forth.

Second, are Asian/Pacific Americans really a "model minority?" Are they really as successful as they have been made out to be?

Third, are Asian/Pacific Americans overrepresented in science and engineering?

Finally, what are some of the problems facing Asian/Pacific Americans in science and technology?

Unfortunately, I don't have time to give you an indepth answer to these questions, but let me at least indicate how I would go about answering them. Let me start with the first question. Who are the Asian/Pacific Americans?

Well, according to preliminary figures from the 1980 U.S. Census, the number of persons categorized as Asian/Pacific Islanders increased by a startling 128 percent, rising from 1.5 million in 1970 to over 3.5 million in 1980. During the same period, the total population of the country increased by only 11.5 percent. So the rate of growth of the Asian/Pacific Americans population was more than 10 times that of the U.S. population as a whole, making them the fastest-growing ethnic group in the country.

The three largest Asian/Pacific American groups are the Chinese, Filipinos and Japanese. Other smaller groups include Asian Indians, Koreans, Vietnamese, Hawaiians, Samoans, Micronesians, and Cambodians. As you can see, it is an extremely diverse population, consisting of several subcultures and numerous language groups.

Much of the increase in the Asian/Pacific American population has been due to large influx of immigrants during the past 10 to 12 years. Until 1965, discriminatory immigration laws dating back to the Chinese Exclusion Act of 1882 prevented any significant immigration from the countries of Asia and the Pacific Islands.

When the racist restrictions on immigration were finally lifted in 1965, there was an enormous increase. In fact, if these racist restrictions had never been imposed, in the immigration from the countries of Asia and the Pacific Islands, the total immigration from Asia and the Pacific Islands would have been much greater and Asian/Pacific Americans today might constitute as much as 50 percent of the U.S. population, instead of just 1.5 percent.

Let me go on to the second question: Are Asian/Pacific Americans really a "model minority?" Given the long history of racial oppression experienced by Asian/Pacific Americans in this country, I think it is interesting that this question is even raised today. During most of their 130-year history in this country, Asian/Pacific Americans were portrayed by incredibly, negative, dehumanizing stereotypes as the so-called yellow peril and were victims of some of the most humiliating and violent acts of racism ever directed against any minority group. These acts have included lynchings, massacres, race riots, denial of citi-

zenship, segregated schools, exclusion acts and, of course, the detention of over 110,000 Japanese-Americans in American-style concentration camps during World War II. More often than not, most Americans are totally ignorant of this unpleasant segment of American history.

However, in the mid 1960's in the wake of the Watts riot and growing urban unrest, there was an almost overnight change in the image projected of Asian/Pacific Americans. All of a sudden stories with titles like, "Success Story, Japanese-American Style," and "Success Story of One Minority Group in the U.S.," speaking of the Chinese, began to appear in the popular press, heaping praise on Asian/Pacific Americans for their seemingly phenomenal success in the face of all their adversities.

These Horatio Alger stories about how Asian/Pacific Americans pulled themselves up by their bootstraps without any help from the Government have proliferated and continue to be perpetuated today.

This "model minority" image created by the mass media is both inaccurate and misleading. Although there has been a lot of to do about all the Asian/Pacific American pharmacists, doctors, and engineers, there is still a larger proportion of Asian/Pacific Americans who are poor than in the general population.

For example, the Chinatowns of San Francisco and New York City are among the most impoverished areas of those cities, a fact that usually escapes the notice of people who visit these tourist attractions.

Moreover, while it has been pointed out that Asian/Pacific Americans have higher average incomes than even whites, when the figures are adjusted for education, weeks and hours worked, age, and geographic differences in cost of living and income—since mostly Asian/Pacific Americans live in Western States—it turns out that Asian/Pacific Americans are earning considerably less than their white counterparts and, in some cases, less than their counterparts among other minority groups.

White Asian/Pacific Americans often gain access to jobs, they usually have a terrible time rising to administrative or managerial positions.

In fact, some friends of mine have told me of "Asian ghettos" within some of the larger aerospace companies in California consisting of large numbers of lower echelon Asian American engineers who never get promoted, and a lot of them end up switching careers because they are dead ended in their positions.

So besides being erroneous, the model minority image has had at least two detrimental consequences. First, it has been used in admonishing other minorities to follow the shining example set by Asian/Pacific Americans by also pulling themselves up by their own bootstraps without depending on Government aid, thus discrediting the protest and demands of these groups for social justice, and creating tension and competition between them and Asian/Pacific Americans.

Second, it has encouraged official neglect of the very real problems faced by Asian/Pacific Americans on the pretext that they have no problems.

Which brings me to the third question, Are Asian/Pacific Americans overrepresented in science and engineering?

Due to the diverse nature of Asian/Pacific American communities, the answer to this question is quite complex. Although I can hardly

give you a definitive answer in the time I have, let me at least mention some of the main points.

First of all, as indicated by Congressman Fuqua, there is no denying that there are large numbers of Asian/Pacific Americans in science and engineering. However, a number of studies, some of which have been conducted by our moderator, Dr. Snyder, indicate that the vast majority of them, perhaps 85 to 90 percent, are non-U.S. citizens or naturalized citizens who immigrated to this country to pursue their college education. Only the remaining 10 to 15 percent are American born.

Now, from the point of view of affirmative action, that is a very significant piece of information. It indicates that American-born Asian/Pacific Americans of second, third, and even fourth generation who bear the legacy of 130 years of racial oppression and who generally trace their ancestry to poor immigrant peasants are probably not overrepresented in science and engineering and, indeed, they may still be underrepresented, although I know of no definitive studies on this subject. There simply isn't the data.

On the other hand, most of the foreign-born Asian/Pacific Americans in science and engineering come from the more affluent classes in their countries of origin and represent perhaps the top one-hundredth of 1 percent of their country's populations.

Consequently, these persons have not suffered the historical discrimination experienced by their American-born counterparts. Moreover, they generally represent an elite class, the cream of the cream, who are likely to do well even as immigrants.

So for the purpose of affirmative action which is intended to overcome the cumulative effects of historical discrimination, it may be necessary to distinguish between foreign-born and American-born Asian/Pacific Americans.

However, the situation isn't quite that simple. There are also many foreign-born Asian immigrants who enter this country as young children. Many of them are non-English or limited-English speaking and come from very low-income families.

Consequently, they encounter many of the same educational problems as other minority groups and often experience great difficulty when they go on to college. Asian Americans from this background are undoubtedly underrepresented in science and engineering.

Now, the situation is further complicated by the fact that when one considers the Indochinese who now number almost a half a million in population here, one must distinguish between the first wave of refugees who arrived in the United States in 1975 and 1976, and the second wave of refugees who arrived from 1976 to the present.

The first wave of refugees who were generally well educated and came from well-to-do families appear to be doing reasonably well in this country. On the other hand, the second wave of refugees, who generally have less education and lower socioeconomic backgrounds than their predecessors, appear to be having a hard time making it in this country.

Although it is too early to tell, one can probably predict that members of the second group will have a tough time gaining access to higher education, particularly in the fields of science and engineering.

Our final complication is the fact that Pacific Islanders, groups such as the Hawaiians, Samoans, and Micronesians, have not experienced the same upward mobility as most Asian Americans, although the two groups are often lumped into the single category, Asian/Pacific Americans.

Their social and economic status is lower than other minority groups and they are suffering many of the same difficulties in education. These groups are undoubtedly grossly underrepresented in science and engineering.

Finally, I would like to point out that female Asian/Pacific Americans are generally also grossly underrepresented in science and engineering, no matter which of the subgroups you consider. The few Asian/Pacific American females who enter these fields tend to go into the biological sciences. They are practically nonexistent in the hard sciences and engineering.

Let me finally briefly address the fourth and last question. What are some of the problems facing Asian/Pacific Americans in science and engineering? Given the complex multifaceted nature of these problems, I won't have time to go into all of these aspects. But let me just mention a few.

As I have discussed, certain Asian/Pacific American groups such as Pacific Islanders, those from low-income families and Asian/Pacific American females are underrepresented. Those from non-English- or limited-English-speaking backgrounds are also likely to be underrepresented.

I think special efforts to increase the numbers of such groups are well justified.

Another problem is the limited mobility they have experienced after they gain access to jobs in science and engineering. Although American-born Asians have little difficulty gaining access to jobs, very few are promoted to administrative positions.

One final problem I would like to mention is a paradoxical one that presents a dilemma for Asian Americans. It appears that many Asian Americans are channeled into science and engineering whether they like it or not. As a consequence, some of them drop out of school, others remain unhappy in their professions, and still others change careers.

The resulting waste in human potential is undoubtedly considerable. This problem is a complex one involving such factors as family pressure, underdevelopment of communicative skills, racial stereotyping by teachers and counselors, and the fear of discrimination in the more subjective fields outside of science and engineering.

Those are just some of the problems I see facing Asian/Pacific Americans in science and technology.

Let me conclude by saying that all of us have the common goal of achieving greater equality and parity in this society. Increasing our participation in science and technology is certainly an important step toward that goal. By working together toward that goal, I think we can learn a great deal from each other's experiences and greatly enhance and improve our efforts in this very important area.

Thank you very much. [Applause.]

Dr. SNYDER. Our next speaker is Dr. Arnold Anderson, executive director of American Indian Science and Engineering. He has had a long and successful career as an engineer and to that he has added work as an inventor, manager and author.

In 1978, he organized and became director of Anderson Research Consultants and has been a consultant to major corporations and governments, most recently to the Indian Commission of Ontario, Canada.

Dr. ANDERSON. Dr. Snyder, thank you. Good morning ladies and gentlemen. Normally I would say chiefs and elders but I'm not quite sure of that.

I don't have a prepared paper, so I will give you my peace pipe and feather story and see where we go.

The previous speaker recited essentially the American Indian story. The only difference is he talked about Asians and my view is the native people of this country. The stories are very similar. I'm not going to talk about that since Congressman Dymally was so kind to ask me to be here.

I wanted to take as much time as I could to give suggestions on what needs to be done. I'm not going to tell you a buffalo story but I will spend the bulk of my time making some remarks and suggestions. I'm not going to make suggestions on how to go about doing anything, just that it needs to be done.

You wise people with your great use of the quill pen and computers can put the language together on how it can be done.

Let me first tell you about American Indians; where we stand, who we are. If we could in any sense put all of our land together in the United States, if we could take all the reservations and put them together, we would be larger than 40 of the States of the United States. We would be larger than 93 countries of the world. The population would be larger than 13 States and larger than 46 countries.

Unfortunately, we are not able to do this. But that gives you an idea of the land and the people.

In my early days, I only knew one Indian chemical engineer and I looked at him in the morning when I shaved. There were only a few technically trained Indians around. I finally discovered there was a mining engineer in the Bureau of Mines and he turned out to be a distant cousin of mine. So, we have come a long way.

Now, in order to try to improve the situation, I and several other people formed the American Indian Science and Engineering Society as a way to nurture this growing population. Our membership is spread out like this: 33 percent industrial; 31 percent in government; 23 percent in educational pursuits; 6 percent entrepreneural; and 5 percent tribal.

Now, I think that pyramid has to be turned upside down but that's the way the situation is today.

As far as the disciplines are concerned, 43 percent are in the hard sciences, 24 percent in the soft sciences, and 33 percent in engineering. Most of that 33 percent is in the conventional main-line engineering functions, not the highly specialized ones.

The origin of these people is primarily from west of the Mississippi. Indians have this thing about east and west of the Mississippi.

This goes back to the historical problems when the cavalry moved the Indians from east of the Mississippi to west of the Mississippi.

So history keeps following us. That's the reason why 16 percent of the Indian science and engineering people come from east of the Mississippi and 84 percent from the west.

Our membership represents 33 States, two provinces, and 108 different tribes. Asian Americans may have a lot of different languages and a lot of different cultures, but just in our little organization, we have 108 different representatives. There are really 292 or more.

When I look at the data on real numbers as far as our count of students in college are concerned, the study in these particular disciplines, the line for black people is pretty distinguished. You can read the differences. The Hispanic is moving along pretty well. Then I look at the American Indian line, and you need a microscope to see the differences in the numbers. So, we have a long way to go.

I have another breakdown from another source. We talked in real numbers and the real numbers are very small. But putting it in percentage, those in the medical or health fields, health sciences, are 12 percent of parity.

When I say "of parity" I mean that number of the Indian population that we ought to have to make it equivalant to American averages. For doctors, we only have 12 percent of parity; in business, 7 percent; scientists and engineers 9 percent.

I looked at the background data for that, and there is a lot of things in that, that in my terms and in terms of my society, we don't count. In regular engineering specialties, the mainline engineering functions, we are only 3 percent. Total number doctorates of all kinds, 7 percent, attorneys, legal, and so forth, 10 percent. Teachers, 25 percent. And most of those teachers have long found their way to Washington, New York, Los Angeles, and elsewhere and are not on the reservations teaching young Indian people.

What are our needs? I and others have done an extensive study on this. If there is any validity to our approach and the data we have collected, we say—I won't give you the breakdowns because it is too extensive—but we need somewhere around 1,700 various kinds of science and technology people graduating each year. While the numbers are increasing, we are not gaining in real terms because technology is moving along so fast that we are not improving our ability to do things for ourselves.

Well, what do I think ought to be done? Most of the things are not new to you because I think all people in our situation have somewhat the same problems and difficulties. We look at the solutions in somewhat similar ways.

However, with the Indian people, it always seems that even people of good will toward Indians structure things in such an institutional way with the effect that Indians fall through the screen. Somehow or other, Indians are systematically excluded, not by intent, but by result. So, we need to do something about this.

Several things need special attention in addition to the other normal things that minority people would expect.

We need to provide some way for counselors who deal with Indian students to become aware of the importance of training in technical

disciplines. Most of the counselors that counsel our young people really have no concept of science and engineering. Not only that, they think engineering and science are not possible for Indian people.

On-the-job career orientation and bridge programs need to be especially designed to satisfy the unique needs, desires, and cultural differences of Indian people.

There are many kinds of recruitment programs and Indians are missed through that system. Something deliberate has to be done, including recruitment visits to high schools.

Indians attending colleges and universities where they represent a significant number should be provided with special Indian counselors.

That's what the organization that I represent is doing. But we need help. The students need accessible tutorial assistance. The first, second, and third semester are crucial. Our data shows that after the fifth semester, we do very well. But we need help in the early times.

Paid summer jobs in business and industry should be developed for advanced Indian students. It always seems like there are a lot of jobs for juniors. But those people are already pretty well on their way. They have a track. They know where they are going. They don't really need the help as much as the earlier ones.

The scholarship programs generally are fixed so that if a youngster earns too much money, he or she begins to lose scholarship money. The great problem with Indian students is that it costs them a lot more to go to college than others because many of them are so isolated, and you know what travel costs are these days. It costs a lot more to get the youngsters to college and compassionate trips home are essential.

I'm going to stop there and go on to another set of ideas. These are ideas that really help in high school and early college years.

We need to do something in this country in whatever institutionalized system exists to insure that Indians be appointed to serve in a representative ratio on foundations, directorates, advisory committees, and review panels, to assure that the seven resource centers for science and engineering becomes a reality for Indians. None of them yet are a reality for Indians.

We need to provide work shops similar to those which have been sponsored by the Science Engineering and Education Directorate especially for Indians. Indians don't know how to write proposals. They don't know how to write proposals that are winning ones, anyway, because the result is almost zero.

We need to provide new and potential Indian scientists with information regarding career opportunities in industry, universities, and the government, including Indian governments.

We need to pursue ways to insure that Indian scientists have opportunities to compete fairly with other scientists for grants and awards.

We need to develop exemplary program models with proven track records for increasing the number of Indians in science and engineering.

With that, I will leave the subject there. Thank you very much.

Dr. SNYDER. Our last speaker will be Dr. Michele Aldrich, who is director of the women in science program of the American Association for the Advancement of Science. Actually, she has an undergraduate background in one of the physical sciences, geology, and obtained her Ph. D. in the history of science. She has published in both fields

and in the area of the history or the sociology of science has been concerned with the place of women in science.

Dr. ALDRICH. My talk today will cover two topics very briefly. First of all, I would like to say a little bit about science and women in general and then I would like to add just a few remarks on the special position of minority women in science.

As far as women in science are concerned, in general, there are two factors that need to be accounted for. First of all, so few women enter science and technological careers, and second, once there, they don't fare as well as the men who enter those fields.

The historical trend of women entering science and engineering is different for that of minorities. Minorities have been kept at very low numbers thanks to discriminatory practices for a long time and gradually have started to rise. The figures for women show a cyclic pattern. In the 1900's, the numbers of women in science are low. They gradually increase and peak in the 1920's. They then decline in the 1930's and 1940's and 1950's and start to rise again in the 1960's and 1970's. What is going on here? In the 19th century, women were involved in science in a logical way as scientific illustrators. That was an acceptable role for women because they were trained in the fine arts, including drawing. There were a few pioneers who contributed directly to scientific research and many women toward the end of the century who taught science. That is, a group of trained women existed who could become the doctorates that you see on that table, thanks in part to the growth of women's colleges.

The upsurge in the 1920's is correlated with the success of the women's movement, and the more tolerant feeling about women in professions. Women who chose careers during that period were less inclined to marry than women professionals today. They could not have as balanced a life as women do now.

In the 1930's, women were, let's face it, forced out of the labor market. During the depression, by Government policy, by industry policy, and by general consensus of the American population, jobs were handed over to men because they were the heads of households and they had families to support. The figures from the 1950's reflect what Margaret Mead characterized as the era of the women with the masters degree driving around in a station wagon in the suburbs with three kids. That was an applicable image for white women but not for minority women.

Today there are still few women entering science and engineering. Why would that be? One of the first problems that we need to face is that of general sex typing. All of you are familiar with this. It is the story of a little girl being given dolls and her brother being given a tool kit. It still pervades the curriculum despite very hard work by educational administrators to balance shop and home ec classes. Shop classes are vital for anybody who is going to go on and do anything in the physical sciences. My not taking drafting in high school was a great loss in my career and I know many other women who have regreted that and have had to take drafting later. This is a problem for which passing legislation does not end the barrier. There has been some progress made and we are grateful for that.

Another problem centers on mathematics. As soon as they are able to do so, girls drop out of the college mathematics track in numbers

that are truly appalling. The same thing happens to some minority groups and it is a problem that is of concern to both groups.

We are all looking forward to Dr. Marrett's data on mathematics because her information will cover many more schools than we had earlier which was from Maryland and Berkeley only. The general information from the National Institute of Educational Statistics will have to serve until Dr. Marrett is out. The message that many girls get is that mathematics is not appropriate for them, that they will not need it for what they will be doing as adults. The trouble with that is that in fact most women will work for a good part of their lives. The image of a woman who is at home as a full-time wife and mother is in fact applicable only to a minority of women and only for a fraction of their lives. That is a false image which is doing great harm in terms of women having any options for the science careers.

Another difficulty with women and math is the idea that women can't succeed at it, that they are biologically not outfitted for math. I don't want to get into the right brain-left brain discussion here; suffice it to say a couple of general points about the biological determinant argument. First of all, the differences in math ability between men and women are not that great and studies have suggested that they can be overcome by training. Second, even if the studies do bear out across gender lines, it is not a true generalization for all women and all men. This is the same argument that W. E. B. DuBoise was addressing about blacks at the beginning of the century—black people show the same range of intelligence as whites and the average is irrelevant. The message did not sink in for blacks and it certainly is not sinking in for women.

The other message that girls get is that science is an inappropriate career for them. This does not have to do so much with odd notions of women as it does with odd notions of science. I see this especially in engineering and geology. These are regarded as quintessential macho disciplines.

If you look at the geology curriculum, great emphasis is placed on field work, classes which are often set in the most barbaric environment that the State can possibly offer. If you in fact look at what geologists do, many of them spend their time working in labs and offices. The emphasis on field work is not proportional, and the idea that all field work is as hostile as the terrains that are used in field camps is erroneous. We have an imbalance between the curriculum and what the discipline actually does.

The same is true for engineering. It seems that many people have the image of engineers as doing tightrope dances on the top of the Golden Gate Bridge spans. This is not true. Engineers do not have physically stressful jobs all the time. The success of many disabled people in both of these fields brings this into question. This isn't a problem of the image of women, it is a problem of the image of science.

Women who do go into science cluster in certain disciplines. First of all, women tend to appear in what are called the helping disciplines, which are regarded as appropriate for their role in life. They go to where they can assist human beings more directly, in the social and biological sciences, rather than helping the indirect route through engineering and the physical sciences. Women enter education for the same reason. When women cluster into fields in which they are already

crowded, the job openings are few and the pay is poorer than male-dominated fields. They are also fields that need less mathematics. I should say a word about degrees in mathematics. Women with math B.A.'s are destined to be teachers of mathematics, not mathematicians. Many will become discouraged as teachers and go on and get advanced degrees.

If a woman does go on to graduate school, one of the first questions that she and her male colleagues face is that of financial aid. If you look at sources of financial support for graduate school, it looks as if there is a picture of gross discrimination against women. This in fact is a very murky area and one which needs a great deal more investigation. For NSF and NIH, part of the distribution of financial aid has to do with the fields that women chose in graduate school. Also, we don't know what the rate of application was of women. As far as NIH and NSF can tell, women fare well in terms once they apply for money, but they don't apply in numbers as high as NSF and NIH would like. Once the woman has graduated, what are her chances of finding a job? We see that women are two to five times more likely to be unemployed than men.

A few words about minority women. I have found that you cannot generalize from the experience of women in science in general to those of minority women in science. Furthermore, you cannot generalize across all ethnic groups when you deal with problems of minority women. It is true there are Asian women in science and engineering in gratifying numbers. When they go into jobs, the problems they encounter are truly discouraging. If you look at peer review panels and other scientific honors, Asian women are seriously underrepresented. Much improvement can take place with their participation in the employment setting.

Minority women do not follow the same field distribution that the majority of women do in science. Therefore, solutions that may apply to majority women's choices may not work well when you are looking at minority women. It looks as if minority women don't go into the helping sciences as much as women in general. This isn't because minority women are hard-hearted. What you also need to know is that minority women tend more than majority women to achieve doctorates in education and that reflects their great concern reforming the educational system of this country to achieve equity for themselves as minorities and as women.

91-931 O - 82 - 4

SOURCES OF STATISTICAL DATA ON SCIENTISTS AND ENGINEERS[1]

CENSUS BUREAU, U.S. DEPARTMENT OF COMMERCE, WASHINGTON, D.C.

The Census Bureau publishes information in many formats about the U.S. population, based on the decennial census and interim surveys of sample populations. Their annual compilation, Statistical Abstract of the United States, issued since 1879, is a valuable and modestly priced reference work. The Bureau issues occasional special reports on women and minority groups.

BUREAU OF LABOR STATISTICS, U.S. DEPARTMENT OF LABOR, WASHINGTON, D.C.

BLS publishes statistics on employment and earnings of U.S. workers, and makes projections of supply and utilization for workers in many jobs. Their Occupational Outlook Handbook provides information annually on employment opportunities, salaries, and working conditions for several hundred kinds of jobs. BLS' Monthly Labor Review offers up-to-date statistics and interpretations of trends.

COLLEGE PLACEMENT COUNCIL, P.O. BOX 2283, BETHLEHEM, PA.

The College Placement Council conducts a study of beginning offers by industry and government to each year's graduates at all degree levels, reporting the number and average amount of offers by field of degree and type of employer. Four reports are issued over the year, with the final report in July summarizing the offers made to graduates of the school year. Only the final report provides information on offers by gender. In an annual roundup of hiring information, CPC subscribers are provided each June with information on the number of graduates hired by business, industry, and government from the reporting schools.

NATIONAL CENTER FOR EDUCATION STATISTICS, U.S. DEPARTMENT OF EDUCATION, WASHINGTON, D.C.

NCES collects data on enrollments and degrees awarded by U.S. institutions of higher education, as well as on other statistical measures of U.S. education. Data from the surveys of Earned Degrees Conferred have been published annually since 1948.

---

[1] From Betty Vetter, "Opportunities in Science and Engineering," Scientific Manpower Commission, September 1980, pp. 20–22.

ENGINEERING MANPOWER COMMISSION, 345 EAST 47TH STREET, NEW YORK, N.Y.

The EMC, part of the American Association of Engineering Societies, conducts annual surveys of enrollments, by year of study, and degrees awarded by level from all engineering schools in the United States and Puerto Rico. These studies have been published annually since 1969 in several forms, by schools, by minority, and by curriculums.

NATIONAL ACADEMY OF SCIENCES/NATIONAL RESEARCH COUNCIL, 2101 CONSTITUTION AVENUE NW., WASHINGTON, D.C.

The Commission on Human Resources of the NAS/NRC maintains the Doctorate Records File, a compendium of information on virtually all doctorate recipients in the United States. Each year they publish a summary report of degrees awarded that year by field and subfield, plus other demographic information on the degree recipients. In alternate years, a survey of a sample of the doctorate population obtains data by sex, field of employment, type of employer, age, years of experience, salary, and other demographic information. The report on this survey is complemented later by publication by the National Science Foundation of more of the detailed statistics on the survey populaton. NSF supports the surveys done by the Academy.

SCIENCE RESOURCES DIVISION, NATIONAL SCIENCE FOUNDATION, 2000 L STREET NW., WASHINGTON, D.C.

NSF publishes data delineating the characteristics of scientists and engineers in the United States. Some publications are annual, some biennial, and some are special reports. The Foundation also supports the collection of data on scientists and engineers by other groups, including the NAS/NRC and the Census.

SCIENTIFIC MANPOWER COMMISSION, 1776 MASSACHUSETTS AVENUE NW., WASHINGTON, D.C.

SMC summarizes virtually all the statistics published on scientists in the United States in its own publications. Manpower Comments, a journal of 10 issues a year, surveys data collecting activities and publications of all major agencies. A biennial compilation on salaries of scientists and engineers is also prepared by SMC. Finally, their Professional Women and Minorities second edition, 1978 and 1980 supplementals) contains about 400 tables and charts with data by gender and minority status for enrollments, degrees granted, and work force participation in academe, the Government, and industry.

Dr. SNYDER. We are, of course, behind, but let's take a few minutes for a couple of questions from the audience, or comments.

Question. I would like to say a very general statement. I find in practice that you always stumble on the restrictions that are written in the laws. So, my request is that when the honorable lawmakers try

to help people, would they do it with a minimum of restrictions? Let me give you some examples.

I have a black student and I find out that the American Society only helps undergraduate students. He happens to be a graduate student. I have an Asian student from Vietnam and then, of course, the grant says that you have to be a U.S. citizen. The student needs 5 years to become a citizen. Dr. Anderson pointed out something that the income limitation is not the same for somebody who is backed up by a comfortable family. So, whether the student is an Indian from Oklahoma or a black student from North Carolina, the minimum of income is totally different than was made here in a law in Washington.

Finally, I have Persian students which do not fall in this group. But I have an excellent female engineer and again she falls out of the categories because she happens to be not a citizen and not a graduate student in this case. So, the general question is if laws are made, could they please be made with a minimum of restrictions and could they be written in such a way that somebody like the head of the department or the dean takes the responsibility that the money is not wasted on cases that do not merit the situation?

Representative DYMALLY. Politicians are not impressed with simple language. [Laughter.]

Question. I would like to address a factor that has not been raised. When you look at the reduction in the overall Federal budget and you couple with that the apparent demise of the Department of Education and the Department of Energy, and you also look at the factor that at the same time the demand for engineering education is increasing to a point where many universities are beginning to tighten their entrance requirements, could you address those issues?

Dr. RIVERA. Pertaining to the Hispanic population, one of the questions pertaining to the data aspects is that Hispanics by and large are not getting through the school systems with adequate kinds of scores in math or science and in many of the other fields. I think for the Hispanics that certainly is the question. If our schools cannot adequately prepare our students in junior high and high school to be able to be competitive, then they are never going to achieve the advance levels of consideration. What that should suggest to people representing funding sources, government and private, is that we have to address this question methodically. For example, one should say, this is what the data at this point appears to suggest and we should address the problem on a longitudinal basis and we track people's achievements over the years. I would suggest in many cases for minorities collectively, that has not been the case.

Since I also have this opportunity, I would like to comment on the previous questions. I think that many people in Government have done a good job—they have taken special pain to insure that certain people have access. There is still need to delineate various types of participation from various ethnic groups and women. I think that it is premature to dismiss this idea. Based on the data that we have for Hispanics, we are not turning out the numbers of engineers that are commensurate with our numbers in the population.

Now, one can talk about parity. Are we going to talk about parity to high school graduates or freshmen in colleges? Are we going to talk about it in relation to the population at large? I think these are the real important kinds of questions that need answers. We have gone too long under the auspices of saying in a very general way that certain types of people are being helped in our society. The reality is that it has not happened. I don't think we should spend a lot of time thinking that it did or talking about it because it hasn't happened. The words of Congressman Roybal stand out in my mind, when he was speaking before the Congressional Hispanic Caucus dinner. He said, "Hispanics are no longer going to take no for an answer." I would suggest that is probably the sentiment evident in the Hispanic community today. Whether it be elementary school, demonstration programs, retention programs, we need them all and we need them in areas where there obviously are high concentrations of Hispanics. We need them now.

Yesterday at lunch, I was talking to a person out in California. He was suggesting to me that one of the major problems in the universities is that many of the people that are there happen to be not as sympathetic to accomplishing some of the goals, not just for Hispanics. The institution he was talking about was a university that has an enrollment of about 60 percent minority. Some of the people that are the decisionmakers, key decisionmakers, actually where things get done are not likely to be as sympathetic to minority goals. That is precisely the reason why there is need for community-based organizations, professional societies, to work on the outside to influence these institutional programs.

Dr. MARRETT. I'm afraid we are going to have to cut off discussion. We have run a little bit behind. We must allow time for the next panel. I would just like to make one or two brief remarks in thanking our panelists. I'm not sure I have picked up many common themes but there seems to be some. One is that we do need to pay attention to the differences in the groups that we are talking about, not only the differences in the problems of minorities and those of women, but to some of the finer new answers, the variations in the situations of subgroups within minorities to which we give the overall term "Hispanic" or "Asian."

Another thing that seems to come up in all of the discussions is that we really have to start early. It is not enough to talk about involving more minorities and women in science and technology late in the course of education, but that we really have to start early, at the junior high school level, if we are going to deal with those problems that stem from the requirements of science and the development of expectations and knowledge of scientific careers that may lead students into these fields.

Thanks to all the members of the panel. [Applause.]

Representative DYMALLY. I am pleased to introduce the moderator of the next panel, Dr. Lloyd Cooke. He is president of the National Action Council for Minorities in Engineering. He is on the Executive Committee of the National Science Foundation. He has a Ph. D. from McGill University in Canada, a member of the National Science Board.

STATEMENTS OF DR. LLOYD COOKE, PRESIDENT, NATIONAL ACTION COUNCIL FOR MINORITIES IN ENGINEERING (NACME); Dr. CONSTANCE TATE, COORDINATOR OF SCIENCE, BALTIMORE PUBLIC SCHOOLS, BALTIMORE, MD.; DR. McKINLEY NASH, ASSISTANT SUPERINTENDENT, EVANSTON TOWNSHIP HIGH SCHOOL, EVANSTON, ILL.; AND DR. MELVIN WEBB, DEPUTY DIRECTOR, RESOURCE CENTER FOR SCIENCE AND ENGINEERING, ATLANTA, GA.

Dr. COOKE. Thank you. Mr. Congressman. It is a privilege to be here and participate on this panel.

As resources seem to decline, as the Nation seems to be turning aside from the basic affirmative action principles to correct past sins of discrimination, it is imperative that we exploit, develop and strengthen those successful model programs which do help increase access, number, and the quality of minorities and women in science and technology careers.

We must continue our battle here in Washington, and in State governments also, to gain equal access.

But on the other hand, it is not necessary to reinvent certain wheels. At the present time, we must focus more effort on replicating the best, the tested models. While insufficient dollars are available it means we also have to look critically at ongoing programs, trim them down, insure that we find out what are the most critical elements of the programs that are underway.

Times are lean, but it does not mean that success cannot continue. In that vein, we are privileged today to hear about three successful models.

After the next speakers have spoken, I will indicate the title and names of people here today that you can meet and talk to at luncheon later, people who are familiar with other systems that seem to work well toward our goal of increasing the number and quality of minorities and women in engineering and science careers.

Our first speaker is Constance Tate. She comes to us with experience in a variety of programs: In teaching, in administration, and in management and in evaluation of that which can be done to facilitate identification of youth with a potential in science and math. She knows how to enable such youth to achieve their potential in these fields and she encourages them to go on to advanced work.

Ms. Tate?

Dr. TATE. Good morning. I am very pleased to have this short time to speak with you. Because the panel ahead of us did such a very good job in delineating the problems and some of the things that they saw. I think will just jump right into the heart of what I was asked to speak about.

Recent research suggests that at the elementary level, there is a narrowing of the scores of math and science among minorities compared with that of the national average. In other words, the scores are getting better. This is particularly seen with black students in the southeastern part of our United States. In regard to the preparation of secondary students who graduate and who had the intention to pursue careers related to science and technology, it has been shown that they seem to get prepared quite well and they go on to do well.

I believe the important point here is that they have the intent in the secondary school to pursue a science or math career.

A third point is that research shows that for young women, perhaps the overriding factor in their choosing a career in science or math has to do with parental encouragement.

If we put those three things together, then we see that we need to arrest the attention of minority students, not just arrest their attention but get them to understand something about the intent through the directions that we give, the consistency with which we give those directions and the motivational factors that we can build in.

This is particularly critical for the elementary student and the middle school student, because it is in those grades that youngsters are still required to take science and math.

Most school systems have a science program and admittedly in many instances at the elementary level, it may leave something to be desired. But it is there.

They also require that youngsters take science 7, 8, and 9. Quite often if a youngster indicates that he is interested in going on to higher education, then he is also required to take algebra.

I believe it is during those years, K–9, that we really have to work to capture students in the majority population and in the minority population. If you talk to persons who are successful in the two fields, they often mention some teacher, counselor, or someone in the community who really turned them on to science or math.

Successful models exist in a number of ways, many of which do not really represent something entirely new, but rather innovative ways of looking at previously successful models and/or combining various components of proven models in innovative ways.

The categorizing that I will indicate are not clear cut, for most of the models have common aspects. It is only for convenience and clarification that categories have been chosen.

Further, only a small number of models that I know of will be cited. It may be well to first examine the common threads among successful models.

I believe that there are several things that I have been able to see. One, that all of the models are based on a variety of solutions.

Because they are based on that, then they have a delivery system of a mix of services, including such things as early identification of high aptitude students, motivational activities, basic skills development, scientific or technological related activities, role models who serve on site, career counseling, career awareness, and some opportunity for career exploration.

They have the support of a number of different agencies, educational, industrial, community and governmental agencies, and parents. They have a means of producing and disseminating learning materials.

Inservice training and informational conferences for educators and other interested persons are usually a part of those models. There is a communication network. It may be very informal or it may be highly structured. But it is there.

And they have an active involved, coordinating group or sometimes this is formalized in a board. If we look at the persons who are involved in such models, then we see certain characteristics. They are

usually interested, committed, are ambitious for themselves and for others.

They have a willingness to communicate physically with students; that is, meet with them, be in their presence, and operate within the school framework. They are responsible and dependable. They are willing to work in a team situation. They have high enthusiasm for voluntarism and they have the ability to show, and I'm underscoring show, interest in young people.

Then, looking at a few models, we look at models for academic improvement. I might cite to you a Ford Foundation project that is in progress at this time for improvement of mathematical competence of male and female minority students.

The programs revolve around intervention and retention, and in work in selected elementary and secondary schools. Universities work directly with school systems, students, and teachers. These projects, and there are nine of them, put particular emphasis on early identification, orientation, and preparation.

Among minority organizations, universities that are involved at this time Tuskegee, Lincoln, Xavier, Fisk, and also AAAS is involved in that Ford Foundation program.

A program of technology in society is a curriculum package that was produced by the National Coordinating Center for Curriculum Development at the State University of New York at Stony Brook.

This is a complete set of materials which are now commercial, exploring math and science and English skills. There are activities for youngsters to do, ways to train teachers, and teachers' guides.

The August Martin High School in New York has a program with interest emphasis on aerospace education. Many people in the United States have gone there to study that setup. The Newark Board of Education runs an intermodal transportation center. That's a mouthful. However, it is a place where youngsters go to become involved with various activities that relate to aerospace.

A program that is going on now with NASA is designed for middle school students. It is called Learning Through Aviation and Space, a pilot study having been done with 10 schools here in Washington, D.C. That program was successful and is spreading to other cities in the United States.

Youth initiative programs under President Carter, I don't know that they will survive, but they did operate last summer usually with universities, selected students who worked directly with a person in research, usually for an 8- or 10-week program.

Low cost information technology, and you know, that's just another way of saying those things that are computer based or involved with computer learning.

In some school systems, the curriculum framework allows for career education development as a part of the science framework or the math framework. There are many informal out of classroom learning activities that are important models.

Such things as 3–2–1 Contact, which began in January 1980, is designed for 8- to 12-year-olds. It is a daily one-half hour TV program. You might want to look at it and invite youngsters you know to see it. It uses animation, live action, documentary films and programs.

The most outstanding part of it is something called the "Bloodhound Gaining" that presents a minidrama and opportunities for model problem solving strategies. There are teachers' guides and workshops for teachers involved.

The FAA and NASA have sponsored a number of conferences on aviation and space education. Science centers and colleges work together to present annual symposia concerned with science careers for women or science careers for minorities. Of course, those are the same science careers that are for majorities.

An organization called "Young Wings, W-i-n-g-s, USA," is a program created by the Flight Attendant Volunteer Corp. They work with institutions, hospitals, and other such institutions on a voluntary basis. There are 1,700 volunteers involved in that program at this time. There is a magazine associated with that program called Young Wings magazine.

General Electric Co. has an expo technical roving exhibition trailer that goes from city to city. It is available in various cities. It gives youngsters opportunities to see and to work with those things that are highly technical that they can understand. But at least it gives them an idea of what is going on in the area. There is a whole group of community-based learning centers. The concept there is to include voluntary services on the part of the student in science-related organizations, industries, museums, and so forth.

A large number of summer programs are available. Here in this area, the University of Maryland at College Park in connection with the School of Engineering runs a very outstanding program called "Women, a Study in Engineering."

It is unique in that it has introduction to engineering and it also does something for the planning of a young woman for her life. This is a summer program that ties in with their program.

Minority institutions to engineering programs is still an ongoing program that is a summer program and large numbers of minority youngsters have an opportunity to get involved.

One of the most outstanding things, and I think that this booklet may be available for you, it is a network of organizations, the National Association of Precollege Directorates, and this book spells out to you a large number, in fact, all of the programs involved: they are programs that are operating in 24 States and the District of Columbia.

I happen to have firsthand experience with two of those programs. One, MESA, which is the math, engineering, and science achievement. And in the Baltimore area, it is sponsored by the applied physics laboratory of Johns Hopkins University. And coupled with that we have engineering pipeline, which has nine industries involved. It is a club activity which has been going on for 7 years, but highly structured, having in it the various components that I mentioned earlier.

The greatest success is due to the fact that youngters come into contact weekly with role models, who sit down with their teachers and plan specific activities. They have some shadowing experiences and things of that nature.

One last point I would bring out is that we must do a great deal to involve scientists such as you in the science education part of what we are trying to do. Each person who is a scientist at some time was a

middle or junior high school or senior high school student. We sometimes forget where we come from.

So I would ask you to reach out and touch some young person. Be willing to put yourself on the line.

The next point is that the minority community has to understand the opportunities. And so, we need a large number of grassroots activities that will get parents involved and other agencies in the community.

Time doesn't permit me to go any further. Thank you. [Applause.]

Dr. COOKE. Thank you. Especially thank you for that listing of the programs that are underway that are effective. Your comment about reaching out is very valuable.

Our next panelist, Dr. McKinley Nash, has been a secondary school administrator for 22 years. He's developed a proposal with the support of the National Academy of Sciences to increase the pool size of minority group members in the precollege level.

He has directed a workshop, which was sponsored by the Academy and the Assembly of Engineering of 15 selected high schools with excellent track records in producing talented minority group members in science.

Dr. Nash?

Dr. NASH. I was basically a high school principal who was tied up in the assistant superintendent's office. Every time I speak in an auditorium, I get gun shy because in a high school when the bell rings, everyone gets up and leaves, regardless of where you are in the speech.

I'm going to hold to my 10 minutes, because I have a premonition that there is a bell around here. [Laughter.]

I bring you greetings from the combat zone. The longest war this country has engaged in since its inception has been taking place in the secondary schools. We have been doing a good job. Many tell us that we are not doing a good job. Whenever the country has called upon the secondary schools with a clear message of what it wanted, it has always responded.

But it—whether it was 100 women to be welders in the shipyards of California or machinists in Virginia, or whether we wanted violinists, or when you couldn't solve integration and you brought it to the schools, we even did that to some degree.

So we have done our share. When we have gotten a clear message. We are populated with keepers of gait and not change agents like you are in higher education.

We have some very serious problems in the secondary schools, irrespective of whether they are located in the buttermilk bottoms of Atlanta; or the Bronx; or Pacific Palisades; or Newton, Mass.; or Evanston, where I am from.

There are problems in the high schools today. A very outstanding panel questioned whether or not the high schools can really prepare young people for the pipeline that would make us competitors in the world of science and technology with emerging kinds of competition we receive from both the Far East and our traditional competitors in Europe.

I think we can. I think we have to. We have to in our education department. We have to if the decline in budget continues. Principals

are something like generals, ayatollahs, supreme justices. We do what we want to do——

[Laughter.]

Dr. NASH [continuing]. When we want to, and suffer the consequences later.

I'm going to talk about some successful models. I have been around secondary schools a long time. I went through all the alphabet series of revisions. I was a regular NSF academic bum. I went to everything I could until I reached the limit, because it was a good way to finance my vacations in the summer, academically oriented.

I went back to my school and I was going to make changes. I could buy the text books. I could put them in the classroom. I would act like ayatollah. But as soon as I walked out, the teachers brought out the old manuals and taught the old material.

To talk about successful programs that people can wipe out is not what I'm going to do. I'm going to tell you about mechanisms that you can integrate into your organization that unless they cut out every penny, they can't stop you from identifying talented youngsters of any kind.

I want to refer you to the information I was given. The group that I worked with 2 years ago identified 15 high schools nationally that had an unusual track record of producing achievement scholars and also merit scholars.

We met for 2½ days with some of you who are here today in Washington, and we reached conclusions about how to identify and nourish and place into the pipeline competent minority group members that would not have to be demeaned by useless remediation at the college level. I do think most of it is useless and is an industry itself and can be avoided.

You may pick that up from William Kelly over at the National Academy of Sciences, or Mr. Thompson with the Assembly of Engineering, and I'm sure someone is here from those groups. You ought to go to the American Council of Education. They ran a series of conference after *Bakke* about pool size.

You see, several years ago when I talked about talented minority youngsters, some of my brothers and sisters would jump on the table and salivate that we can't do that. We can't be elitists. But it appears that the number of minority group members with 3 years of science, 3 years of English, and 3 years of math ready to enter our colleges is less than 2,000.

I didn't say 4 years. I said 3. And I didn't miscount. I didn't say advanced placement calculus. I didn't say advanced placement English. I said 3 years of college prep math, college prep English, college prep science, with a quantitative and a literary ability to write and to speak, is very small.

That pool size question has been addressed in a paper after a series of conferences after the *Bakke* decision. I am sure you can buy the position papers. I will give you specific references if you need them later on.

Some other things are happening that we need to deal with. In the Southern States, they were influenced by the reformed secondary edu-

cation written by Frank Brown—we are on speaking terms with each other after some arguments—that said that schools were custodians for youngsters and you ought to lower the compulsory age to 14, not 16, or 18 like in Wisconsin.

Besides that, you ought to lower the requirements for graduation: exploratory math, some science, a little reading, and let them go. Those requirements have been lowered in several sections in this country, and it makes it easier to graduate than it was 10 years ago.

On top of this, we have the back to basics movement. It has been decided that science is not one of the basics. They are really kind of leaving science out. You know all of this. You know the impact, don't you, of *Bakke?* I don't care what anyone says about *Bakke* being a decision, *Bakke* was a matter of public opinion.

It has impacted upon admissions of minority youngsters and minority group members. You know what is going on about financial support. You saw the TV last night. You know what is going to happen nationally as far as leadership for education. You know all these things.

You know those minority youngsters who are being produced by our high schools. Whether they are from Evanston Township which spends $4,000 per student and has 35 percent black and had less than 1 percent in its honors courses 5 years ago, they are still finishing, even from the best of schools, with the same kind of preparation that was less than adequate for work at the college level.

You know what kind of, I call them extended educational experiences that have a lot of remediation for our youngsters that adds 5 and 6 years on a 4½-year or 5-year program.

You know all these things, so I need not talk about them. I want to talk now about pool size. We could look at pool size from two or three perspectives. One is the perspective of capable minority group members who are ready to move into management positions and research positions, and that's been addressed.

You know about the lack of that pool. We could talk about pool size from those minority group members that are now in the pipeline at the bachelor's degree level who need to move to advanced degree level. And you know about those, too.

I want to talk about pool size at the secondary level or the precollege level, because that's where the pool pipeline ought to begin to develop a pool on the other end. Several years ago, something happened in Evanston's normally liberal North Shore.

One of our assistant superintendents released test scores by race, and gee, wasn't it exciting? All hell broke loose. Now everyone knew there was a significant difference, but the liberal-minded set didn't attach guilt to that significance, and looked around where I was principal and said, "You do something, you do something quick. Here is some money. You correct it. We want this thing corrected. We want scores changed. This is a bad picture. This makes us look really like racists." [Laughter.]

Dr. NASH. That was not a language difficulty I had. I did mean it that way. So we began to work on this. We began to watch a few things that were happening while we were doing this. We were being told that scores were declining.

We said good, we can catch up. That's not correct. Scores decline for most individuals going to high school. For those interested in math and science from 1969 to 1978, the scores actually increased. We were caught in a little thing I didn't know about.

Then the scores for those in the top 5 percent were going up. The general scores were dropping so it didn't look so easy. "Well, we will give you some more money."

We decided to throw out all the frame of references we knew about. What do we know as the best judge of human potential? Someone said a teacher's judgment is best.

So we had youngsters entering this school at grade 9. We had four tracks: a regular track, an honors track, an advanced placement track, and a track for minorities.

Also, other people who had special education problems. That's really the size of it. That was the size of many of the affluent high schools in suburbia. We are on site, but we are not in the same classes. We decided then we had to have some commission to make a policy decision. "You tell us the policy decisions you want made, and we will make them." They did.

We went back to the entering ninth grade class that year in 1974 and began to read their cumulative records. We found boys and girls who were interested in science in the first, second, third, fourth grade; and in the fifth, sixth, seventh, and eighth grade something happened.

We found other youngsters who were late bloomers. We decided to be integrationists. I had 60 youngsters initially, subsequently 120, and then 300 who had middle Stannine scores.

In our high school, seven, eight, and nine went to honors and advanced placement; four, five, and six went to regular courses; Stannine one, two, three were retained in classrooms.

We decided the best way we could get out of this, since the white-black comparisons on test scores were similar to those comparisons economically, what I call a temporary middle class if we lose two checks, we are lower class again, the comparison was we didn't have many youngsters in seven, eight, and nine Stannines.

The best thing to do was to look at the middle Stannines and I had some black youngsters who we felt had some pressed test scores.

To prove this, we would identify 60 blacks and 60 whites, give them no help at all, keep the identification locked in the superintendent's safe, have assessment conferences with their parents and define what was necessary for success at the Evanston Township High School.

Those parents that agreed to sign a kind of Chinese contract where if you did not succeed, we will meet again and assign fault to somebody, either to us or to you or to the child, we put those kids in those classes and we began to meet.

There was some attrition of teachers and some parents because the fault was assigned to all of us at various times. But the success rate was at 9 percent of those minority youngsters who made the honor roll in those honors classes, and they didn't have one day of tutorial help, no special grouping in those classes.

I was told all those teachers were racists, the students would isolate them, and the ceiling would fall down, but they succeeded.

Then we picked up 120 and then we picked up 300. The National Academy became interested in this process. I won't describe it. You can get the proposal. We had trouble getting it funded because it is for a local operation, not for a national project.

I'm not interested in national projects. I'm interested in projects for building principals, parents, and teachers. I think you ought to know the basic ingredient: identification of the youngster. You know how to identify youngsters. The literature is replete with ways of assessing youngsters. One way is in meeting that youngster and his parent through a mechanism that involves a key teacher or another significant person who will monitor that youngster and his colleague in relationship to that youngster.

Intervention. When someone fails to assign fault and direction to adults but not to youngsters to restructure the youngster and his goals, and finally to place youngsters into universities and colleges and summer programs their junior and senior year to make a difference.

You can tie into the kind of networks that are being sponsored in your community. I have a specific recommendation for Congressman Dymally and this group that pertains to that. I think with the block grants, since they are coming, there ought to be some set-asides at the state level for comparative grants to high school to restructure the high school programs.

The high schools in America must be studied and must be changed before we can have success, or we have to go in on a piecemeal basis like I have just described to you, and nourish a handful of students.

I think there ought to be moneys at the State level available through block grants for high schools, to look at what is necessary to produce and increase the pool of capable minority group members so that they will be representative, and the business world, the medical world and the world of engineering won't fight for the same 2,000 students.

I heard a record the other night which you heard, I am sure, because you saw the program, "White and Black Crisis." I guess I have seen a thousand of them. The most impressive thing was a blues singing record, "I don't know why I don't give up," something to that meaning.

I am often fighting, I win many battles, but I also lose the war. There must be a better world somewhere. Every time I look around, we are fighting for our poor children, and there has got to be a better world somewhere. [Applause.]

Dr. COOKE. We are next privileged to hear from Dr. Melvin Webb, the Deputy Director, Resource Center for Science and Engineering, Atlanta, Ga.

I have visited him and I had a specific objective in my visit. The Federal funds end next year and several components of it, I am convinced, can be and should be funded in the local community. I am the kind of guy that is going to stay with it and see that it is done in Atlanta.

Dr. WEBB. I think I made a lot of mistakes in my life. One I made today was to follow Dr. Nash. [Laughter.]

What I would like to do is to share with you some information about one of the most exciting things that I have been associated with in my career as an educator. The experience that I have had working with that program is owed to a lot of people. I know that.

Some of those people are present with us today. One of them is my boss, the project director, Dr. Thomas Cole, who is in the audience.

If there is anything in this program that we talk about that makes sense to you, Tom can discuss that with you.

Another person in the audience that had a lot to do with the development and initiation of the legislation and activities that go with getting appropriations and moneys set aside is Dr. William Jackson. There are other people who I can't see from here.

If somebody is out there that I missed, forgive me. The people whom I see, I think we ought to recognize and give credit because I think they did a magnificent job in getting through the legislation that organized what is presently called a "Resource Center for Science and Engineering."

The resource center concept is a relatively new concept, one in which the combined resources of the university, the colleges, the local community, and the region are brought to bear on the problem of the underrepresentation of minorities and women in science and engineering.

The first Resource Center for Science and Engineering established in this country was established at Atlanta University. It was established there after some very stiff competition involving more than 20 institutions, minority and majority, from throughout the Nation.

I think that the decision was a wise one. It was fitting and proper that the first center was established at Atlanta University. It has a rich history, a strong track record in production of minority scientists and engineers.

In addition to that, approximately 5 percent of the Nation's Ph. D.'s in science, math, and engineering are located at Atlanta University. They have a built-in role model.

Nevertheless, it was established there. The Resource Center is being implemented at Atlanta University through three functional components: the Atlanta University Center component, the regional institutions component, and the community outreach component.

We run the gamut in educational programs from kindergarten to postdoctoral. Each component has specific activities it is charged with developing and carrying out.

The Atlanta University Center component is charged with responsibility for developing a strong graduate component to the extent that Atlanta University member institutions in our network can become competitive, in the National Government and the private sector for grants and contracts.

One of the things that has happened is that now we have established a Ph. D. program in chemistry. There are some people who might question, why would Atlanta University need a Ph. D. program in chemistry? There are lots of Ph. D. programs in chemistry around the Nation.

I think it becomes important when you consider that if the Ph. D. program at Atlanta University matures to the extent that it can produce five Ph. D.'s a year, we will be in the position of contributing to the Nation, about 25 percent of the chemists being trained in this country. That's why the Ph. D. program is important.

We have also established a master's degree program in physics, a MS degree program in mathematics with emphasis in computer science, and we are strengthening our programs in biology to add emphasis to molecular biology.

We have made major equipment purchases, made significant library acquisitions, and we provide significant student support.

As a matter of fact, if you look at the data and if the data is correct, the Resource Center at Atlanta University is supporting more students in terms of graduate assistantships than the National Science Foundation.

We provide for faculty lines and we provide each new faculty addition at the university with research initiation money so that these professors will become good teachers and will also have an opportunity to participate in research.

With regard to the regional institutions component, we tried to establish a network with some 40 historically black institutions in the southeast. Those States that we are directly involved with include North and South Carolina, Georgia, Florida, Mississippi, and Alabama. There are presently 40 colleges in our network.

There are a number of programs again that this particular component is charged with carrying out.

Among the kinds of activities you will find in the regional institutions component include many courses for professors throughout the academic year. Also, we will sponsor a series of short courses, or minicourses, if you will, for professors from colleges in our regional network. Those short courses are held sometimes at Atlanta University, and other times at institutions in the network. We have had conferences in Greensboro, N.C., and at Bennet.

Right now, as a matter of fact, we have about 150 students and faculty members involved in a biomass conference at Tuskeegee Institute, which is sponsored jointly by the Institution for Scientific Research and Engineering and our organization.

When I left last night, the program was going very, very well. It is another example of the kind of things we do through the regional component.

We sponsored a national conference that focused on issues for minority science education. We will be sponsoring a second conference this spring. That conference will be held in Atlanta.

The regional institution component makes it possible for faculty members in the regional network to have equipment repaired. The expense of that is picked up by the resource center.

We provide members in the network with many grants for their own research effort, not necessarily to initiate research but to continue research that is ongoing if they are having difficulties getting funds to complete a project. They can make application and moneys will be forthcoming provided, of course, the budget allows.

We provide for travel to professional meetings and laboratories so that they can become up to date with laboratory techniques.

We have been a part of a series of proposal writing workshops that involve minority institutions throughout the country. We have also provided a summer enrichment program where we bring in students from the regional networks.

These students, 30 per year, come onto campus and are involved in mathematics, computer science, and the physical sciences. The reason that we zero in on these areas is because of the results of a survey we did of the institutions. We found out that the strongest departments

in the sciences were in the biology departments. The weakest programs were in mathematics, physics, and chemistry.

In an effort to augment the training in those areas, those subjects will be the focus of the summer enrichment program for regional college students.

Moving on to the community outreach component, this is the component charged with helping to further science activities. We run incremental credit courses for teachers, counseling workshops, and student programs.

Recently we completed a series of radio programs on bioethics that was conducted through a radio station that is historically the black radio station in Atlanta. The response to that program was phenomenal.

It was an interpretive radio program and very often people would be driving down the streets of Atlanta and pull off over to a telephone booth and ask questions.

We had a series of energy lectures. We sponsored science awareness booths in shopping malls around the city. We have an annual counselor workshop where we bring in counselors from the metropolitan area and talk with them about the problems that we see in students coming from their schools and to make suggestions along with them. We don't bring them in and tell them what to do.

Dr. Tate talked about getting scientists involved in the educational programs. The counselors are involved at Atlanta University with scientists, mathematics, and engineers. Collectively we try to thrash out the problems and come up with solutions.

We try to prepare teachers who will be working with our students. We bring in approximately 50 to 60 students per year, run them through an 8-week rigorous academic program focusing on mathematics, physical sciences, independent research projects, and computer science.

To this date after 3 years of operation, every student who has been through the summer programs is now enrolled in college somewhere in this country. All except two of those youngsters are majoring in a math-based curriculum, either physical sciences, biological sciences, engineering, or computer science, etc. I don't think that another program in the country could boast of those facts. We have figures and names to back that up.

Last, I think this is the most exciting program in the whole concept in Atlanta. This is the Saturday science seminar where we bring in on Saturday morning 200 youngsters from 9 to 12 from metropolitan Atlanta and expose them to science, math, communications fields, and computer science. If you stand in the doorway on Saturday morning, you are likely to get knocked down because that's how excited they are about it.

We have had that program now for 3 years. We have involved some 800 youngsters. Just recently, we completed an independent evaluation followup of that. The results are phenomenal. On a national basis, as

an example, only 3 percent of the females at the end of elementary school would consider a career in science and mathematics.

Of the graduates of the science academy, females included. 95 percent of these youngsters in grades 3 through 8, indicate that they are seriously considering careers in science, math, and engineering.

Dr. Cooke is looking at me. I have to stop here. If you have any questions, I will be around to talk to you later.

Thank you very much. [Applause.]

Dr. COOKE. The students will run you down if you stand in the doorway when classes start. If the teacher is 5 minutes late, the kids jump up and down, anxious to get going. It is as thrilling an experience as one can get, seeing youth at that age so anxious to learn. And the girls are right there with the boys. They have their dolls but they are right in their with math and physics. We had a discussion about stereotyping. To see this untyping occur is something to behold.

You have heard this particular success story. There are more. There are several representatives in the audience today. For example, this booklet described NAPD. These precollege programs have organized into the National Association of Precollege Program Directors. Here today is Nate Thomas from Chicago, Barry McLaughlin from Philadelphia and Kenneth Hill from Detroit. There may be others here.

Write down those names and talk to them at lunch. Get a sense of what is being done and can be done in community efforts using resources of industry, local colleges, high schools, institutes of science and museums to put on very effective programs, catching youth early and giving them a taste of science and math.

Then there's an association of college program directors that are dealing with retention of minority students in colleges; a very, very important aspect. Marian Blalock from Purdue is here. Nate Thomas wears two hats; college and precollege. Then there is Alvin Rivera who is active in the Society of Hispanic Professional Engineers.

Seek them out and get a taste of what can be done. A good example of each is attempting to reach through and find the most critical elements. As resources decline, it is imperative that we find out how to have the same level of success with fewer resources. People in the community can help achieve that goal.

I would like to tell you something about the organization to which I belong, but there isn't time. However, on the table outside we have provided data with regard to changes in the enrollment of minority engineers from 3,000 in 1973 to 11,000 this last year. This is the result of national and local and ethnic groups working together. The combined result is dramatic.

The most critical element now is to insure that those students enrolled in college graduate.

QUESTION. I would like to ask Dr. Nash if he would comment on what he thinks the impact of the move towards a voucher program or division credit for private schools is going to have on the minority pool in our urban schools?

Dr. NASH. I really have been pondering the question. The question is what impact will vouchers, division credits, and the movement toward the private schools have upon the public schools.

QUESTION. Specifically the minority pool.

Dr. NASH. I think they are going to make an attempt to go at the top 10 percent of minority youngsters either with athletic or academic potential. It is unfortunate that many youngsters with athletic potential in the right kind of environment also have good academic potential. They might get one or the other either way.

They are attempting to do that in and around the Chicago area. It is evident to us that the inner city youngsters in Chicago in large numbers are in the parochial schools, predominantly Catholic schools.

I think it is happening in other parts of the country. I think public schools will be the answer because we have a staff, although unionized, that makes the difference. I think it will be short-lived. I think the cost of education is too high for them to make a substantial dent in that pool.

No one really knows how to identify all the resources that ought to go into making that pool bigger.

QUESTION. It seems as though there is a common theme that students have to be challenged to succeed and even challenged early in science. One of the things that is puzzling to me is the movement of the public school system away from the hard courses. I was appalled that not all students, though I know that this is true, are required to take the fundamental courses in mathematics and science.

Could you comment on why this occurs and why it should be this way at all? Why shouldn't there be a requirement that all students take the fundamental courses?

Dr. TATE. I'm afraid I can't let you lay all of that on schools because part of that reflects what we think about education in the United States. Another part reflects what the public is willing to support. You know that in the last few years, particularly, all kinds of bond issues and other things for support of public education have failed. People have not wanted to support it.

Now, another part of the problem is that within the schools, those requirements are there except that at State levels there may be just two credits in science and two credits in math, for instance, as a State requirement.

Part of it goes to what Dr. Nash was talking about, the fact that the youngsters aren't in the right track so to speak and don't end up with the critical subjects. There is no intent, and if I understand your question, the schools are not trying to necessarily hold these youngsters back.

Many of our youngsters really see no reason to kill themselves with math and science courses if, in the end, they are not going to get anyplace. They see their older brothers and sisters with high school diplomas, unable to go to college, and unable to get a job sometimes with a college diploma.

That is not a satisfactory answer, but it is the way the system has worked. That is why all three of us are imploring you to have a grassroots movement to motivate youngsters for them to see the worthwhileness of being involved with math and science.

It is not the easiest course they can pursue.

Dr. COOKE. Thank you.

QUESTION. Very little has been said about model programs for women and I would like to make a comment on that area.

There are more than 500,000 women who already have bachelor's degrees and are unemployed or underemployed with respect to their abilities and aspirations. This is in the science and mathematics-related area. Working with these women can have the biggest impact in the shortest period of time.

The National Science Foundation career facilitation program which began in 1976 addressed this group. These projects were of three types, updates in the original field, a new component to a chemistry field, conversion to a new field, or updates which added a new component.

More than 1,500 women have already participated in these programs and I would like to say that minority women have participated in these programs at a significantly higher rate than their participation in any other area of higher education in science and engineering.

The programs have been successful in recruiting and educating and placing women in math fields, electrical engineering, chemical engineering, and computer science.

Dr. COOKE. What are the ratios for minority women?

QUESTION. About 15 percent.

Dr. COOKE. Alright.

QUESTION. The University of the District of Columbia—while it is here in the city amid all the resources—it has a problem and a possible solution.

The Department of Defense 2 years ago started a very small pilot program to interest minority students in careers in engineering and science. They weren't totally altruistic because the DOD labs cannot compete salarywise for engineers and scientists with industry, so they are looking for employees, obviously.

The program involves taking talented high school students, employing them for the summers, and those who show any promise at all are carried through the school year on a part-time basis whether the student works Christmas or Easter or what, in science and engineering tasks and carried right through his college career.

UDC has seen that the pool that was mentioned from which we can cull these people in this area is too small. Somebody has got to get out there and do something and I think UDC is a nice model at this point in this city.

Dr. COOKE. Are there other questions?

QUESTION. I have a comment. Someone alluded to it earlier this morning—that we would like to leave with some plans for doing something as opposed to just talking about our problems.

I would like to make some suggestions. I would like to hope that at the end of this conference that we would go back to our communities and try to involve the appropriate persons, for example, various news media or other forms of media that we have, to make recommendations to high school students.

I have this problem—I work at the college level but I find that the students that I try to recruit, don't have the appropriate courses for entering the sciences. We find that to a great extent now; someone mentioned earlier that this was not the case with their situation. But to a great extent, students are misguided intentionally at the high school and junior high school level. I would like to see us try to touch parents, and have fliers distributed in churches indicating what courses students should take in the high schools.

In fact, I think this should be given along with questions as to whether or not your child would be interested in going into engineering, whether or not your child would be interested in the sciences, or whether or not your child would be interested in going into medicine. If so, your child should take these courses.

I would like to see, also, as a result of this meeting, a coalition between the various minority groups so that we could address our problems politically. We could contact the various congressional representatives and try to get them to support our effort. For example, it would be a tremendous impact on an individual to pick up a box of Kelloggs dry cereal in the mornings and see recommendations for courses that he should take.

Dr. COOKE. Thank you.

Incidentally, what we haven't done so far at this conference, is to have the people from the audience give their name and affiliation. We do have a steno typist. When you make comments, let the lady know your name and where you work. It would be helpful for the record.

Let me conclude and build on what you said in a way. I have imprinted in my mind, this statement: Any child in the seventh and eighth grade who is a year or two behind in arithmetic will never see him or herself as an engineer or be encouraged by a teacher or a parent or a counselor to engage in the rigorous courses included in three years of math and science in high school.

Those youth are foredoomed from careers in computer science, business administration, engineering, and physical sciences. It is absolutely impossible for this Nation to continue successfully and to even survive with the wipeout that is occurring today.

The suggestions that you made with regard to early identification and encouragement is going to require parents to examine and guide their children. It will take a long time before the elementary school teachers get to that point because the greatest shortage in the Nation is of math-qualified teachers in elementary schools. There has been a wipeout there.

All the careers we have been talking about today are primarily math based. Without adequate math coming from the start of high school plus rigorous study through high school and college, there is just no potential for participation in the careers we are talking about.

Just think about what has been done in Evanston schools and Atlanta schools on Saturday. I have been around the Nation and have seen several model classrooms where the youth, given half a chance, are tasting success in learning. When that happens, you can't stop them!

I would suggest that we now go to the Rayburn Building for lunch.

[Whereupon, at 12:06 p.m. the conference was recessed, to be reconvened at 1:55 p.m. that same day.]

The luncheon was convened at 1 p.m., by Hon. Mervyn M. Dymally.

LUNCHEON SPEAKER—DR. HOMER NEAL

THE ROLE OF THE NATIONAL SCIENCE FOUNDATION IN SUPPORTING THE DEVELOPMENT OF MINORITY SCIENTISTS AND ENGINEERS

Representative DYMALLY. Ladies and gentlemen, may I have your attention, please? It's exactly 1 o'clock.

Before I introduce our guest speaker, I want to make an introduction. We have with us today Congressman Won Pat. Congressman, would you please take a bow?

[Applause.]

Representative DYMALLY. Thank you very much.

Our guest speaker today is the provost of the State University of New York at Stony Brook. He is a member of the National Science Board and the recipient of the Guggenheim Foundation fellowship, the Alfred Sloan Foundation fellowship, and the National Science Foundation postdoctoral fellowship. He has also held membership on the High Energy Physics Advisory Board of the Department of Energy and on the board of trustees of the Argonne Universities Association.

He is professor of physics, specializing in high energy particle studies, and has conducted experiments on particule interactions at Argonne National Laboratory, the Brookhaven National Laboratory, Stanford Linear Accelerator Center, and at CERN in Geneva.

I am pleased to present to you the provost of the State University of New York, Dr. Homer Neal.

[Applause.]

Dr. NEAL. Thank you very much, Congressman Dymally.

I am particularly honored to have the opportunity to speak to you today about the role of the National Science Foundation in supporting the development of minority scientists and engineers.

Dr. Slaughter, the Director of the National Science Foundation, would have liked very much to be with you today, and he has asked me to convey his regrets that he is unable to do so. He is representing our Government at meetings in Saudi Arabia and Egypt this week.

In the time allotted to me, I wish to review for you the mission of the National Science Foundation, to describe some of its activities, and discuss its commitment to addressing some of the issues concerning minority and women scientists and engineers that form the focus of today's meeting.

The National Science Foundation was created in 1950 by an act of Congress for the purpose of strengthening scientific research and education. The authorization language for the Foundation provided for a wide range of options for its intervention and support in the Nation's science and technology. Over the years there have been many examples that demonstrate the effectiveness with which the Foundation has operated. Many of the scientists supported by the Foundation have eventually received the Nobel Prize in their field. Many others have

made significant contributions to the knowledge base for technological innovations which have increased food productivity, economic growth, and improved understanding of fundamental mathematical, physical, biological, and social systems.

There are also numerous examples that illustrate the impact of the Foundations' work in addressing issues having to do with the development of human resources, including those of the minority community. The problem is that the Nation needs to do much more. Let me briefly examine the scope of the problem.

Black graduate enrollment declined by about 3 percent between 1978 and 1980, while enrollment of other minority groups increased by 15 percent or more in that period. In the fall of 1978, black graduate enrollment was 5.3 percent less than it was in 1976, while the overall graduate enrollment declined only 0.9 percent in that period. The proportion of graduate students enrolled in science and engineering courses in 1980 was 11 percent for whites and 4.6 percent for blacks. Between 1978 and 1980, the overall undergraduate enrollment for white students increased by 7.6 percent. For black students, the enrollment increased by only 4.8 percent. The fraction of the undergraduate students in the physical sciences who were black declined from 5.1 percent to 4.9 percent between 1978 and 1980.

These statistics are rather disappointing, and I will return to discuss them in a few moments.

It would be useful to ask ourselves precisely why there should be concern about the low level of representation for black students in science and engineering. From a purely national view, the small representation indicates an extensive human resource pool that is insufficiently tapped at the very time the country needs to marshall all of its talents to deal with the numerous fundamental and technical problems it faces.

As an example, recent studies indicate that there are over 2,000 academic engineering positions in our universities which are unfilled because qualified and interested persons cannot be found. While this has serious consequences for the present, the effects on the future are even more alarming. It means that since the absence of the needed number of faculty members translates into the production of a less than needed number of future engineers, the problem will likely get even worse in the coming years.

This is a matter that affects almost every facet of the Nation from our economic, military, and political strength to the very well-being of our society.

The gap in the supply and demand of engineers could have been much reduced, had aggressive efforts been made to attract more talented minority students into this area previously.

There is also a human side to the matter. Nothing can be more exciting to a person who is scientifically inclined than to be able to make fundamental contributions to the advancement of knowledge. The process of doing so provides a level of personal fulfillment that can hardly be matched otherwise. The paucity of minority students and engineers represents an unmeasurable loss of sense of accomplishment for a significant fraction of an entire race.

Furthermore, there are economic reasons. Blacks can ill afford to exclude options in science and engineering from their career choices.

There are also policy issues involved. More and more, decisions having to do with science and engineering are having an overlap with social issues. It is important that all segments of society participate in a knowledgeable manner in the formation of these decisions at the Federal and State level. This will require the involvement of scientists with global perspectives, as well as with perspectives of specific social components of the population.

In sum, there are a multitude of reasons why the waste of human resources reflected by the poor representation of minorities in the ranks of scientists should be of concern to the country.

There are many factors which contribute to the disappointing statistics that I have cited. In the elementary and secondary schools, there is a loss of almost 25 percent from the potential pool of blacks for undergraduate and graduate study. The U.S. Census Bureau data indictate that in 1979, 25 percent of all blacks between 20 and 24 years of age were neither enrolled in school nor were high school graduates, while only 17 percent were enrolled in college.

A further reduction in the number of black students going into science and engineering is attributable to negative counseling at the high school and college level. Black students are often advised, on quite inappropriate grounds, to enter vocational or nonacademic programs. Furthermore, those students who do choose to pursue academic studies are often tracked away from courses in the hard sciences and mathematics, thus effectively limiting their further access to advanced studies in these areas.

Another major factor in the low rate of participation in graduate education by blacks is the high dropout rate at the undergraduate level. Most institutional and Federal attention in recent years has been directed toward increasing the entry rate of minority students. Little has been done in the area of retention. There are many forces tending to interrupt and terminate a black student's educational career. These include adjustments due to past academic deficiencies, social problems, and financial problems.

Let me address the financial problem issue. The cost of a graduate education represents a formidable barrier for many students. The need in many cases for students to go deeply into debt to finance their undergraduate education often precludes the possibility of further loans for graduate study. There has been a rather poor record over the past decade of this problem being significantly alleviated by support from institutional, private, or Federal sources.

A study revealed that the National Science Foundation was cited as a source of support by 1,147 recipients of a Ph. D. in 1978. Blacks received only 18 of those awards. In that year at the institutional level at universities across the country roughly 24,000 Ph. D. recipients cited teaching and research assistantships from the universities as the means by which they financed their graduate education. Only roughly 400 blacks were included in that number.

These numbers clearly illustrate how isolated black students have been from the traditional means of graduate education financial support.

Next, I would like to say a few words about recent steps that have been taken at the Federal level. The Office of Education's graduate and professional opportunities program was a direct attempt to address

the problems above. In 1979–80, there were 566 new awards made, with roughly 56 percent going to blacks. Though the number of fellowships is modest, the effect has been significant.

Now I wish to discuss some of the National Science Foundation initiatives. At its August 1981 meeting, the National Science Board, which is the governing body for the National Science Foundation, adopted a statement which contains the following language:

> The National Science Board proposes a core of activities focused on people, especially those who will bear major responsibility for the future excellence of our scientific and technological enterprise. These activities will build the human resource base for science and engineering and express the Foundation's determination to encourage and assist all students, with particular determination to tap the underused talents of minorities and women.

The Director of the Foundation and his staff are presently developing means to implement this policy.

In the past there, of course, have been several special fellowship programs, science education programs, and actions by the various research directorates within the Foundation to implement programs that would assist minority students and scientists. The current effort is a renewed attempt to forcefully address the problem and seek lasting solutions.

In another action, the Foundation recently implemented the creation of a Committee on Equal Opportunity in Science and Technology. The committee was established by Public Law 96–516 in December 1980. The purpose was to provide advice to the NSF concerning the implemenation of the provisions of the Science and Technology Opportunities Act and other policies and activities of the Foundation in order to encourage the full participation of women, minorities, and other groups currently underrepresented in scientific, engineering, professional, and technical fields. The committee is functioning well and is in the process of developing recommendations to the Director. The report of the committee will be forwarded by the Director to the Congress this fall, along with a plan that the Foundation would hope to follow in contributing its share to enhancing the flow of minority and women contributions to science and engineering. This will be a very important document, which I hope will stimulate solutions to some of the problems that we have discussed.

Next, I would like to say a few words about the standard research support mechanism within the Foundation. I am not referring to targeted programs, but the manner in which the Foundation manages its awards to individual scientists to carry out research. This is important because the large bulk of the Foundation's funds go into such activities.

Criteria have been developed that are used in the review of proposals submitted to the Foundation, and I wish to mention the four criteria currently employed.

The first one addresses the question of whether the research can be performed compentently. It relates to the capability of the investigator, the technical soundness of the proposed approach, and the adequacy of the institutional resources available.

The second criteria deals with the intrinsic merit of the research itself. It is used to assess the likelihood that the research will lead to new discoveries or fundamental advances within the field of science

and engineering or have substantial impact on progress in that field or in other scientific and engineering fields.

The third criterion has to do with the utility or relevance of the research. It is used to assess the likelihood that the research can contribute to the achievement of a goal that is extrinsic or in addition to that of the research field iself, and thereby serve as the basis for new or improved technology or assist in the solution of societal problems.

Finally the question is asked, "What is the effect of the research on the infrastructure of science and engineering?" Included under this criterion are questions relating to the scientific and engineering personnel, including the question of whether there is participation of women and minorities. Thus, an effort is made by the Foundation to insure that there is sensitivity about support of minorities and women in the standard research programs.

There are some accomplishments of the Foundation that I can mention briefly. In 1979, the NSF minority graduate fellowship program was established which then provided 50 portable fellowships, which was 10 percent of the 500 fellowships awarded by the NSF during that period. The 1979 recipients of those awards chose the top 20 universities in the country, and they were clearly a select and highly motivated group of students.

Another activity which I would like to bring to your attention is the program on Resource Centers for Science Education. These centers serve as the focii for graduate centers but also have components at different age levels. After a competition, Atlanta University was awarded funds to establish the first center in 1978. Two additional centers were funded in New Mexico and Puerto Rico, and one additional center was funded in New York this year.

Resource Centers for Science and Engineering encourage the participation of students from minority and low-income families in science and engineering by establishing geographically dispersed resource centers. A resource center serves a variety of functions for the various constituent groups in the region in which it is located. It addresses the problem of minority students having access to established scientists and quality science programs. There is also a professional development segment in the program for minority faculty. It has been a very successful program.

The research apprenticeship program for minority high school students has also been implemented. It gives talented minority high school students hands-on experience in science and engineering research. During the summer the students work on research projects with individual scientists. Academic year activity includes part-time research at the grantee institution, research at the student's high school and in other contexts.

The Resource Centers for Science and Engineering, the research apprenticeship for minority high school students programs, the minority institution graduate traineeship programs, and the minority graduate fellowship program, are all examples of activities that are having an impact and increasing the prospects of minorities entering careers in science and engineering.

Unfortunately, the current budget situation casts serious doubt about the future of these programs. It is my personal hope that this matter will be resolved soon and favorably.

The problem of how to motivate and effectively train our students is perhaps one of the most important problems facing us today. Much has been done to this end, but much more needs to be done. Roughly half of the black population in the United States is under the age of 25, The educational experience that these young people will have will greatly influence the future of the entire race.

I have detected during my time on the Science Board a genuine concern of the Board regarding the national need for bringing more minorities into careers in science. With the continued dedication of the Board, of many of the fine staff of the Foundation, of concerned citizens, and with the assistance of Congress, I hope that the above problem will eventually be made tractable.

Thank you again very much for the opportunity to address you.

[Applause.]

Representative DYMALLY. Thank you very much, Dr. Neal.

We have between now and 1:45 to get back, but I think we have about 10 minutes. If anyone wants to make an observation or ask a question of Dr. Neal, you may do so now.

If not, thank you very much. We'll see you at the Humphrey Building.

AFTERNOON SESSION

Representative DYMALLY. May we invite the panelists to come up, please, and the moderator, Dr. Rosenstein? Dr. Pfafflin, Dr. Spight, Dr. Lawson, Dr. Moss?

As you probably see, this is a panel that covers a wide range of interests. So, we are going to ask the panelists who are very sensitive about cheating on papers not to cheat on time today. Our moderator is professor of engineering at the University of California, Los Angeles, Dr. Allen Rosenstein. He is going to be moderator.

Before the good doctor begins to moderate the panel, let me say a couple of things because I sensed during the luncheon discussion some anxieties that I share about conferences and that is where do we go from here? Most often we come to these conferences and we never hear from each other and nothing happens. At the risk of telling you what I plan to do this afternoon, and I suppose most of you want to hear, let me do it now. What is planned are the following: One, we will set up regional meetings next year. We will hopefully take this braintrust from the limited confines of the Congressional Black Caucus and put it into the arena of the Congress in both the House and the Senate. And then, based on some new rules that will come up in the next 30 days, we can no longer comingle public and private funds, and we will set up an assist support group on the outside or individuals, for industry, for institutions.

So we will have on the one hand the congressional braintrust and on the other hand as a support group we will have the citizens braintrust. Then we will publish a newsletter and coming out of this conference we will have a paper published to summarize the deliberations today. I am negotiating with the American Association for the Advancement of Science for a Fellow. If any professional organization has any access to fellows, congressional fellows, we will be glad to have one to work on this braintrust for us. We do plan to follow up. I

thought I would let you know lest you go away thinking you will never hear from us for another year.

I now give you Dr. Rosenstein.

STATEMENT OF DR. ALLEN ROSENSTEIN, PROFESSOR, ENGINEERING, UCLA; DR. SHEILA PFAFFLIN, HUMAN RESOURCE RESEARCH, A.T. & T.; CHARLES HUGHES, BELL TELEPHONE LABORATORIES; DR. CARL SPIGHT, VICE PRESIDENT FOR CORPORATE RESEARCH, AMAF INDUSTRIES, INC.; ARTHUR D. ROGERS, PRIVATE BUSINESS CONSULTANT FOR SCIENCE, TECHNOLOGY & INNOVATIVE ENTERPRISES; MELVIN THOMPSON, SENIOR POLICY ANALYST, NSF; DR. JAMES LAWSON, CHIEF, UNIVERSITY AFFAIRS OFFICE, NASA; DR. THOMAS MOSS, STAFF DIRECTOR, U.S. HOUSE OF REPRESENTATIVES, SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY, SCIENCE AND TECHNOLOGY COMMITTEE

Dr. ROSENSTEIN. Thank you, Congressman Dymally. We have a very distinguished panel this afternoon which presents probably the most important viewpoint of all, that of the user and employer and in some cases the implementer of minorities and women into the private and public sectors. It seems obvious that when we are concerned about the preparation of minorities and women, we must take a very hard look at the preparation for what. What are the characteristics of the career opportunities that are available today? And even more important, what are the career opportunities that will be available during the next 30 to 40 years, which is the working span of the people who are entering the market today. We must ask ourselves also if the study of science and math is a career goal simply unto itself or whether in the real world such studies are simply the key that opens the doors to a cross spectrum of career opportunities.

I would like to take the opportunity to point out that the two cultures viewpoint of the English-speaking world stands in sharp contrast to that of the rest of the world. England, Canada, and the United States will commonly talk about science and technology on the one hand, and the arts and humanities on the other. This is the two cultures concept that C. P. Snow wrote about some years ago.

By contrast, most of the world has a three-part viewpoint with first technology standing with the professions and not with science, second science, the pursuit of knowledge standing alone, and third, the arts and the humanities. There is considerable evidence that the two cultures English model coupling technology and science has not served our country or our minorities very well.

Our panelists today have a breadth of achievement that is so broad that unfortunately it would consume our entire hour of panel time if all I did was present part of their achievement. I hope you will all forgive me, then, if I abbreviate their introduction.

Our panel, I think, will also set a new record for this conference. We have five topics, seven speakers, at least two topics are going to be presented in tandem. We must, therefore, limit our time to approximately 10 minutes per topic.

Our first topic this afternoon will be presented by two speakers. The

first is Dr. Sheila Pfafflin, president of the Association of Women in Science. She is the manager of human resources research at American Telephone & Telegraph. She is a member of the National Science Foundation Committee on Special Opportunities in Science—Equal Opportunities in Science and Technology. Her accompanying speaker will be Mr. Charles Hughes, who is department head for counseling, placement and university and technical institute relations at the Bell Telephone Laboratories.

Dr. Sheila Pfafflin?

Dr. PFAFFLIN. Thank you.

Today, I would like to look at the question of minorities and women in science and technology in industry, in the context of effective human resource management of our pool of scientific and technical personnel.

The increasingly technological nature of our society and the projected shortages in technical areas have already been commented on by previous speakers and I would just like to reinforce two points here. First, as many have pointed out, for a long time, only about 11 to 14 percent of the population has gone into science and technological fields. The only major underutilized pool, therefore, to expand this number greatly consists of minorities and women and we must find ways to do that.

Second, the impact of the increasing use of technology on those who are now employed in low-skill jobs and do not have the skills to go into technological jobs is going to become increasingly severe in the future. Minorities and women, many of whom have been crowded into such jobs, must be trained to take advantage of the new technological skills. For example, it is estimated that a substantial portion of the salary gap between males and females today (women only earn about 58 percent of what men earn) is due to the fact that they are crowded into a small number of jobs which are frequently low-skilled and which tend to be underpaid, at all skill levels. Similar problems occur for many minority groups. These problems are going to be greatly aggravated in the future and we must plan now to deal with them.

Now, I would also like to make briefly some distinctions with regard to the kinds of barriers which minorities and women face. These can be looked at as being of three types. Minorities and women can be under-represented in the pool of scientific and professional personnel. They can be under-represented in certain sectors of our economy, relative to their numbers in the pool, or they can be presented in sectors of our economy, but underutilized. They may be under-represented in management positions, for example, and over-represented in support positions. Now, all of these problems face minorities and women in industry today although perhaps to somewhat different extents for different groups.

All groups, as we heard this morning, are under-represented in the pool. In addition, there is evidence, particularly in the biological sciences, that women are under-represented in industry in terms of their availability. Finally, there is clear evidence that women and some minority groups are underutilized in the sense that they are under-represented in positions of power, decisionmaking positions, and over-represented in service and subordinate positions.

Now, the solutions to these various problems, of course, differ. To increase the pool, we need to emphasize efforts to increase the numbers

who go into these fields. However, under-representation relative to the numbers in the pool requires emphasis on recruiting efforts. Under-utilization requires emphasis on personnel policies; better staffing procedures, greater concern with selection for promotion, training, career development and so on.

Now, there have been very extensive industry efforts to deal with under-representation of minorities and there have been some efforts, particularly some in the Bell System, and elsewhere, to deal with under-representation of women in science and technology as well. I will not go into these programs in any detail. A number of them have been mentioned this morning, and Mr. Hughes will be dealing with some Bell System programs in a moment. But I would like to make two points.

One, I wanted to comment on a remark of Dr. Bulkin's this morning about the NSF Reentry programs. The Bell System and other industries have found these programs for women in science to be a very good source of technically trained personnel. The programs, although funded on a small scale, have been very effective. They deal with a problem which I think has not been sufficiently addressed and that is that, although we are facing shortages in certain areas, we have an oversupply of technical personnel in other areas, particularly in areas where women and some minority groups are relatively well represented.

The most effective way of dealing with this situation is to retrain people who already have much of the necessary training. This can be done successfully and I think that one role industry could play is to support such programs more fully.

I would also make a second point with regard to targeted programs. Although the Bell System and other industries have supported many targeted programs for minorities and some for women, we also support a great many programs in the educational area which are not specifically targeted. One thing which we are doing and which many other companies are doing, as well, is to emphasize the participation of minorities and women in their regular programs and make every effort to make sure that these are appropriate to these groups and that they are reaching these groups. I think this will be an increasingly important strategy in the future.

With regard to recruiting mechanisms and personnel systems, I would make a similar point. There have been relatively few targeted programs in this area and I think, on the whole, that is appropriate. The successes of industry in promoting women and minorities have come from improvements in their personnel systems: In their staffing systems, in better recordkeeping, and in other personnel procedures. I think that this is an area where developments should be strongly encouraged in the future and where you should expect your major contributions.

We have in the Bell System attempted one semitargeted program to get people from nontechnical management into technical management, particularly members of protected groups, although the model, I think, is more general. It addresses a problem, a general problem which we face, and that is the retraining of our technical personnel to keep up with changing technology. But I did want to emphasize that a great deal can be effectively done without targeted programs

in the recruiting and promotion area and that there are increasing efforts in this direction taking place.

I would make just one last comment on those. Complaint procedures have been an important part of some staffing developments and I think this might be an area where congressional effort would be valuable because right now there is a kind of double bind in that where legal action is a possibility, it is difficult both for the company and for the employees to use these procedures with complete freedom and effectiveness. Some congressional action in this area might be helpful. Thank you. [Applause.]

Mr. HUGHES. Good afternoon. Do you know how hard it is to collapse 9 years worth of history into 5 minutes? I'm going to try that by putting into perspective for you the activities of one company in particular, Bell Laboratories, in the area of developing minority and women's talent in science and technology, trying to capture a quality of work life issue as it exists once those people have gained the skills and entered the industry.

Since 1972, the laboratories have initiated a series of programs, which now total nine for the provision of scholarships or fellowships in engineering. Two of these programs are distinctly for fellowships leading to the doctor's degree. Since 1972, there have been 405 scholarship recipients, including fellowship recipients, and there have been 165 completers or graduates of the programs. There is still a good-size student population that is in the process of completing the programs.

These scholarship programs provide full tuition, room, board, books, and fees. They are awarded directly to individuals by Bell Laboratories, and generally not to an organization, which in turn funnels the money to the individual. A key connection between the scholarship recipient and Bell Laboratories is the assignment of a mentor from within Bell Laboratories. A member of our technical staff is linked with each scholar for the duration of their academic program. And also, for their summer work experience, because the scholarships also have a component providing summer work experience at the laboratories.

There is another program that is not for scholarship but is a motivational program and provides a summer research experience. Since its inception in 1974, it has had 456 students go through as of the end of 1980.

We haven't neglected the junior and high school students, either. We have a program called Summer Science School, that annually has an input of about 100 junior and senior high school students drawn from the junior and senior high schools in communities surrounding our laboratory locations.

As I indicated earlier, the key to all these programs is mentorship. Mentorship is the old-boy concept. We have taken it and applied it to students and new employees who are moving toward or entering careers in science and technology because that is the way the majority have gotten there—there was a mentorship relationship somewhere. That mentorship involves personal commitment. Just as each of us here has a personal commitment to the theme of this whole conference, the same kind of personal commitment from the employee population of a company is necessary to make its programs successful.

The personal commitment is fostered in a number of ways. The

most significant is that the company provides the facility for dialog between groups of employees and management. It involves employees on advisory committees and task forces, to wrestle through problems and come up with the solutions that work the best.

Nine years ago, maybe 10 years ago, that didn't exist. To focus on one of the things that Dr. Pfafflin said Congress can do, one of the spearheads to any corporation's movement into the area of affirmative action was legislation and that cannot be allowed to die a slow death and not have any emphasis on it. It is very easy, I believe, to drift back to the kind of arena that we have had to struggle in prior to the 1970's when many, many gains were made.

One other area of activity that the laboratories has engaged in is to provide support to the six black engineering schools—Howard, Tuskegee, North Carolina A. & T., Southern University, Tennessee State, and Prairie View. That support, while not unique from what other companies do, does have a few unique components to it, one of which is the provision of faculty support. We recognize, too, that black schools suffer from faculty shortages and black schools also suffer from having available funding to continue the advancement of the education of their own faculty. We provide faculty development grants to each of those schools, which have been used very successfully in advancing the educational levels and the technology level of the faculty that are teaching and grooming students who will populate the pools from which all of the private agencies, Government agencies, and industry will ultimately draw their personnel.

Thank you. [Applause.]

Dr. ROSENSTEIN. Our next topic should be of considerable interest. It has to do with minority business. We have two experts. The first is Dr. Carl Spight. He is vice president for corporate research, AMAF Industries, Inc., a minority business, and speaking with Dr. Spight will be Mr. Arthur D. Rogers. He is a private business consultant for science, technology, and innovative enterprises.

Dr. SPIGHT. Thank you for the introduction, Professor Rosenstein.

I want to begin by applauding the courage and commitment of Congressman Dymally and his staff for calling together a workshop of this kind. It is clearly the kind of gathering whose time has come; whose position at this particular stage in history is critical. I hope we are able somehow to realize the potential of this kind of gathering. In particular, I want to challenge Congressman Dymally and his staff to be audacious and courageous in moving with some expedition in followup of this gathering and in particular in calling for the formation of a braintrust that will position itself in an advisory and in a lobbying position with respect to legislative issues, with respect to the kind of retrenchment and processes of retrenchment that we see in the land at this particular time. This is a time to move with courage and speed.

The questions of representativeness of such a braintrust, I think, can be met head on. The question of resource availability of support of such a braintrust I think can be met head on. There are resources represented by this kind of gathering that can meet these questions. We need to move with courage and expedition and I challenge Congressman Dymally and his staff to do that.

The title of my remarks are "High Technology Innovation, Economic Recovery a Minority Enterprise." I am certainly going to be

quite brief here, even though one could consume more than the total time allotted for this particular workshop section in talking about the particular issues here.

There is a single theme I want to sound in these remarks and that is, in the efforts for achieving national economy revitalization and the efforts for achieving vitalization of the economic base of minority communities and the efforts toward achieving adequate and enhanced level of participation by minorities and women in science and technology, in those kinds of efforts it has consistently been the case that minority business enterprises have been both underestimated in their potential contribution and certainly underutilized. That is my theme, that there is an opportunity here for creative utilization of the entirety of the resources of the minority community and that includes the minority business enterprises.

Certainly, the minority business community is a fledgling business community, representing a small sector of the national economic community. But it can be demonstrated and Arthur Rogers and I have in our efforts at understanding the potential, we certainly claim to be able to demonstrate that there is a central role that minority business enterprises can play. Certainly it is the case the Federal recognition of social equity is on the decline, if anything. Certainly it is the case that we have to focus on questions of contribution and productivity. Certainly it is the case that new business opportunity and new job opportunities in the areas of science and technology are going to come from high technology enterprises.

It is critical that some of those be located in the minority communities if there is ever going to be any movement forward in the minority community. We have to take into account the growth opportunities in minority business enterprises. I could belabor that point at length, but I won't at this point. I want to emphasize that the pipeline we talk about, the pipeline that people have said starts at the prenatal experience, that kind of pipeline has to find an organic place in the community and the minority business community is one place to effect that. There is a national synergism between the business sector and the rest of the community. There is growth opportunity in the business sector. There are job opportunities. There is real wealth-producing opportunity in there. I'm going to defer the rest of my available time to Mr. Rogers, who will talk about those new technologies that can constitute the basis for growth of the economic sector in the minority community and the growth of the entire community.

Thank you. [Applause.]

Mr. ROGERS. My comments will attempt to set in perspective some of the opportunities on technologies relative to mature growth and emerging industries.

During my preparation for this presentation, I examined 11 areas where there are significant growth opportunities or business options for minority business enterprise. They are as follows: Automated batch manufacturing, composite materials, welding and joining, textiles, power meteorology, organic coding, semiconductors and electronics, industrial radiation processing, corrosion, biotechnology, bioengineering, information and telecommunications.

In order to indicate what some of the significant business opportunities for minority enterprise might be, I will cite three examples of

those technologies and what the growth potential might be in terms of actual dollars. At the present time, as is well known, minority business enterprises do not receive or conduct a significant amount of business relative to the overall private sector.

However, many of the technologies which are currently emerging provide enormous opportunities. For example, some of the technologies would provide between $600 million and $1 billion worth of business opportunities per year for minority business enterprises. I will start with my specific examples and talk about automated batch manufacturing. It is estimated that if a generic technology development program was implemented today, it would result in $30 to $50 billion worth of value added manufacturing improvement in an industry that already generates approximately $300 million.

Some of the specific areas that are available for business opportunities include the following: Robotics, flexible manufacturing systems, computer integrated manufacturing. Let me take the example of robotics. By 1990 General Motors is expected to have over 10,000 robotics in their factories.

If you would look at the cover of the current edition of Fortune magazine, it says that the next industrial revolution relates to automated manufacturing and robotics and related areas. To carry that further in terms of actual manpower, it has been projected that in the next 20 years, the introduction of new automated technologies are going to impact approximately 45 million workers who are in the work force.

It has also been estimated that by the year 1990, robotics will exceed $5 billion a year in sales. The other major area is composite materials. At this point, that industry represents $5 billion in sales.

The annual growth rate is approximately 15 to 20 percent a year. Composite materials has applications in energy conservation, weight reduction, corrosion, fatigue resistance and noise reduction industries. It is estimated that the growth rate is worth $50 million in expanded business. It is also estimated that between the present time and 1985, General Motors or the auto industry will spend approximately $600 million worth of composite materials.

Semiconductors is another area that has enormous growth potential. For example, that industry is expected to grow between 10 and 20 percent annually during the next 5 years and that sales during the mid-1980's is expected to be between $8 and $12 billion.

The other area which I would like to just touch on very briefly is bioengineering and biotechnology. Companies such as Gentech that have gone public were the hotest selling issues on the market when they were announced on that particular day.

Indeed it is significant to note that biotechnology conceivably may resolve or help to answer some of the complex and difficult problems related to sickle cell anemia. Indeed, based on some of the work of scientists today, it is projected that the agriculture industry will be completely revitalized or revolutionized in the next 20 years.

I will conclude my remarks with those comments.

However, I do have information about some of the other technologies and it is available if there is any interest in obtaining it.

[Applause.]

Dr. ROSENSTEIN. Our next speaker is Mr. Melvin Thompson who will address the quasi-public viewpoint. This is the viewpoint of the

senior policy analyst with the National Science Foundation. As you know, the Science Foundation is supported by the U.S. Government but it is not an integral part of the Government. It is a quasi-public institution. Mr. Thompson?

Mr. THOMPSON. Thank you.

The National Science Foundation is part of the Government. It is part of the executive branch.

Today's panel has the topic how the private sector looks at science and technology. I would like to emphasize three points that might be appropriate in terms of today's panel.

The first is developing a case and a rationale for why the public and the private sector should be involved with minorities and women in science and technology. Most of the programs in existence today that many of you may be familiar with grew out of the concept of affirmative action and equal opportunity.

Well, that concept was good and we still need equal opportunity and affirmative action. But as you know in light of today's climate, we need additional strengths to support minority involvement in science and technology. We need to develop a case for minority involvement in science and technology on the themes of increasing productivity and innovation and economic recovery and security.

In the area of science and technology, minorities and women should participate. I would like to briefly outline some points through which that case should be made and presented. American preeminence in science and technology is currently being challenged by European countries and Japan. As we look at the automotive industry and certain facets of the electronics industry, we see increased imports.

One suggestion is that perhaps our productivity is declining. Well, women and minorities can enhance the productivity of science and technology and we need to present that as part of our arsenal for our involvement. There are critical shortages in personnel in certain areas of science and technology.

Engineering, physics, physical science and biotechnology. There aren't enough persons skilled and trained to go into those areas. Women and minorities represent a pool of talent and they should be involved in that area.

The third element of the case that I hope is presented is economic recovery and economic development. If you pick up the Washington Post or the New York Times or the Wall Street Journal or any magazine, you see where the jobs are. They are in technology. They are not in the social or behavioral sciences. Minorities represent less than 2 percent of the technical manpower force in our Nation. There is also another reason in terms of economics and that is in terms of this country as it grows toward more increased use of technology.

We need managers who have an understanding of science and technology. Someone suggested—in fact, this was published—that one-third of the baccalaureate degrees awarded in Japan are in engineering. No wonder Japan has such a high technological productivity. Or, that may be one contributing factor.

We should instill that within our youth. The second point I would like to make is that the case for minority involvement in science and technology should be made by employers of scientists and engineers both in the public and private sectors, industry and government.

It should be made by educators because that is where the careers are in the future. Certainly, also, in our minority community.

Unfortunately we don't hear enough among our minority institutions about the value of science and technology in the lives of blacks and other minorities.

The final point I would like to leave with you is a suggested strategy for action. To address the problem adequately, it cannot be done solely at the national level. It must be addressed at each level of our society, State, local, and national. At the State and local level, the problem is elementary and secondary education.

The Federal role in education is very small. Unless we instill in our community organizations the value of math and science education, we will never see parity for minorities in science and engineering.

Also, the strategy must involve the mainstream of the scientific community. Organizations such as AAAS, the National Academy of Sciences, the National Science Foundation, and our professional societies all have a vital role in this.

We can't talk to ourselves. We must involve the mainstream of science and technology.

We must not forget the role that our black colleges can play. Approximately 85 percent of the black physicians in this country earned their undergraduate degrees at black colleges. A majority of the Ph. D's in science and engineering today earned their undergraduate degrees in science and technology. There are six traditionally historically black engineering schools. They can be strengthened and expanded. I leave you with these comments. First, we need to present a solid case that supports the basis for minority involvement in science and technology, not from an affirmative action point of view or simply equal employment opportunity, but because it is in the Nation's interest to involve and produce women and minority scientists and engineers.

[Applause.]

Dr. ROSENSTEIN. Thank you, Mr. Thompson. Our next speaker is Dr. James Lawson who is Chief of the University Affairs Office, the National Aeronautics and Space Administration. I might observe that Dr. Lawson was formerly president and professor of physics at Fisk University.

Dr. LAWSON. Thank you. Before getting into the content of my remarks. I want to say for the benefit of my colleagues who have labored in the field of the historically black colleges that it is very interesting for me to be on this side of the fence.

One observation that I have obtained from my short experience at the Space Administration is that there is not enough communication between our colleges and NASA; but, I would extend that observation to include other agencies as well. All of us are working to close that communications gap. At NASA, with the awareness of the importance of minority institutions, that goes back to perhaps 1963, the Agency has in various ways sought to show that it appreciates the role which these colleges play in the American scheme of higher education.

First, I would say that the credit for the development of our activities at NASA must go to the director of our equal opportunity programs. Dr. Jenkins, and to the manager of our Special Projects Division, Mr. Pohly. I wanted to state that publicly because in some of our sessions, I felt that Dr. Jenkins felt that I didn't believe women

should be involved in these programs and also because Mr. Pohly has had some questions about my commitment across the board. However, I do, indeed, conceive of a position for women and we are actively involving them in all programs at NASA.

NASA is unique in the sense that it represents a mission agency. That is to say, it has been charged by the Congress to fulfill a specific mission. This is important in terms of involving the minority college because it means that as a mission agency, there are many activities that we cannot engage in in the same way, let us say, as the National Institutes of Health or the National Science Foundation. The perception of the unique role that NASA has as a mission agency has not been fully appreciated by a number of our colleges and universities. So, we certainly want to emphasize that from the very outset. The experiences that have developed at NASA in its attempt to involve minority colleges have gone through sort of an evolution. At the present time, these experiences have come together in the formation of a program that we refer to as "minority enhancement for research in technology and science." We have to invent the science and technology in order to invent an acronym.

Everything has to have an acronym. We call this the merits program; that sounds good and tends to connote that nobody will be in this program unless they merit consideration. But, the merits program at NASA, which you will be hearing more about in a formal way, consists of six components.

The first one directs itself at the high school and college community. It is conducted by our aerospace educational services group. Some of you may rememberr that the Atomic Energy Commission used to have a traveling arrangement whereby a trailer would spend a week or two on a college campus to acquaint faculty members with the techniques involving the use of radioisotopes and to generate, in some measurable way, interest in the use of those isotopes. Well, NASA has had an aerospace lab, that has done much the same thing. It has been confined to the high school sector, very largely; however, it has now been extended to college campuses with a special emphasis on minority colleges and universities.

The second thrust, which NASA has done to involve universities in their various research and development programs is very important, I believe, as a key to the involvement of universities with NASA is the summer faculty fellowship program. This is a 10-week program in which faculty from the colleges go to a NASA center to become actively involved in research at that center. There is, I would say, a modest stipend provided for their upkeep during this time.

Our review of this program shows that over 30 percent of those persons who participate in this program apply for and receive certain grants or contracts with the agency. So, this has been going on for quite awhile. We find it a very effective way in providing a linkage with the agency. We are stepping up our efforts in this direction this coming year to insure that minorities or persons who teach at minority colleges will be included in those who are awarded grants by earmarking money to provide for five faculty members from minority colleges. So, we should see an increase in the involvement of minority colleges through this route.

Then we have a program which is geared to the graduate level called the graduate researcher's program. This provides a general

stipend, around $8,000, which is awarded to a graduate student working toward a master's degree or a Ph. D. degree from which he is expected to pay his tuition. In addition to that, there is a stipend provided the institution so that the faculty member who is supervising his thesis work can travel back and forth to the center where the student will actually undertake his experimental work. This, you can see, is kind of a selfish arrangement because it does, indeed, provide the centers with additional manpower in a very low-cost fashion. Nevertheless, it also provides an opportunity for graduate students to further their work toward either their terminal degree or a master's degree.

We have initiated a program which we call the research capabilities augmentation program. In this program we will have a few minority universities, competing among themselves, for sizable grants over a period of 5 years. In this way, the universities can be assured of making plans over that period and we can provide them with money that will be needed to significantly augment their capabilities for research. Now, we are restricting this to institutions that have already demonstrated ability to conduct research. The hope here is that through this enhancement they will be able to compete in the mainstream and that we can after 5 years turn to additional institutions who express an interest in participating in this program. This will require a commitment on the part of the institutions who apply for this competition. It will require really more than just lip service to the idea of research. It will provide for release time for faculty who are engaged in this kind of an activity and, all in all, will indicate that research has a high priority at the particular institution. The grants would be from $200,000 to $400,000 and perhaps more, now that Mr. Reagan has signed the Executive order indicating that agencies will be expected to increase the commitment they have made to or plan to make to historically black colleges. So we view this as a means of making it possible for a few schools to do planning over a long enough time period so that they, indeed, will be able to compete in the mainstream of research institutions.

Now, 5 years may not be long enough, nor $400,000, but we are hoping to develop a close relationship with industry to augment the support provided by these grants. At the present time, we have very good working arrangements with two firms, International Rockwell and Lockheed, with substantial grants to two of our historically black universities. We expect to extend and amplify this kind of industry-agency-university arrangement.

I would finish my remarks by urging those of you who are involved with the historically black schools to establish better channels of communications with the agencies. As a former college president, I know that we shouldn't depend on the college presidents to get the word to those people who are going to be involved in the research. We have learned that the hard way because he is under some pressure to do a number of things and does not have the time really to give to this kind of thing. Therefore, we have identified people at most of our institutions to whom we address these opportunities. This is an example of what we are doing. We believe it is simply an example of how a mission agency can, indeed, generate fulfillment of our realization of the kind of contributions that the historically black colleges can make.

Thank you. [Applause.]

Dr. ROSENSTEIN. Thank you, Dr. Lawson.

Our next-and-last speaker is Dr. Thomas Moss who will address the legislative viewpoint.

Dr. Moss is staff director of the U.S. House of Representatives Subcommittee on Science Research and Technology. He joined the Congress after a period of time spent teaching and conducting research in physics.

I note from personal knowledge that Dr. Moss has been engaged over a number of years in the creation of what I consider some of the most forward-looking legislation becoming available to us now.

Dr. Moss?

Dr. Moss. I'm very grateful to the organizers for giving me the privilege of talking with you today. I have already gotten some excellent ideas from speakers and participants on how to make our subcommittee work more effective.

I will indicate, as many speakers have, that I hope this will be a continuing dialogue. There is certainly nothing that helps us more in the legislative area than an occasional shove and maybe even a couple of kicks from the outside. So, if we can create that kind of dialogue, it will be very useful at least from where I sit.

I could easily echo a number of the points that the others have mentioned. I agree with most of the things they said about the need for, and justice of, more fully involving minorities and women in science and technology activities. I will try, however, to avoid being too redundant.

I am on the program, obviously, to talk about the political and legislative situation. But, I will warn you that, frankly speaking, I think this is a somewhat artificial subject. Our legislative and political actions are often clothed in a expansive-sounding political rhetoric or bureaucratic double-talk which may not have as much substance as other ideas we can pursue.

After going through the standard bureaucratic and political double-talk, then, maybe I can talk a little bit more about what I think are the broader ideas concerning the participation of minorities and women in science and technology.

A lot of you worked with us on the Science and Technology Equal Opportunities Act of 1980, and you know the kind of political constraints and taboos with which we were faced. They are especially common in these days of fiscal and ideological retrenchment.

One, of course, is that no new money can be spent. A second is that there can be no numerical quotas, ratios, targets, and no set aside of funds. Another is that no new administrative structure can be set up.

And, a fourth which is perhaps a special one that we have in science areas, is that no social goals are to be intermixed with the basic support and design of science. Science is to be isolated from social goals.

Obviously, we could all discuss with some intensity whether these constraints and taboos are fair and appropriate. But whether or not they are, I think they are very real. Our original ideas in the Science and Technology Equal Opportunities Act had many violations of these dogma. We originally had the typical ideas usually associated with equal opportunity programs. We wanted to do something about role models, starter grants, curriculum development, advisory committees, special assistant, reporting requirements, and so on.

In the end we got, I think, the thrust of the idea. It was a push for renewed energy in bringing minorities and women into the talent pool.

But we certainly didn't overcome the political currents against the currently unfashionable aspects of the legislation. Our way of handling those political constraints was by focusing on the more "practical" aspect similar to that which some of the previous speakers have touched on.

We couldn't talk too much about fairness, justice, or anything of that kind. We had to talk about societal, not minority, need for equal opportunities. Society as a whole. We had to discuss the equal opportunity idea as a science program, a program for obtaining needed scientists and engineers. That's why we had to bring minorities and women into the talent pool. Not for any other reason.

Of course, pragmatically, that approach worked and it is still working. The fact that we have a crisis in engineering manpower is a great asset to building support for an equal opportunity in science program. Almost anyone will accept the notion that we should draw talent from wherever we can get it for the self-interest of the rest of science and the rest of society.

By talking in a somewhat cynical and politically pragmatic way, I don't mean to say that we shouldn't debate the question of whether social goals should be included in science. It is an old debate, obviously. People have been talking about it for centuries.

I think it is something that we need to keep alive here in the Congress and in the professional societies and elsewhere.

But, as some of the other speakers have pointed out, politics right now has led us to the current path. Out of necessity we must take the pragmatic approach that the equal opportunity thrust is chiefly for the good of society as a whole. Fortunately, this is currently a credible argument.

We are also fortunate because I think the leadership of the Foundation, for whatever motivations, takes this issue very seriously. I think Dr. Slaughter, Dr. Langenburg, Dr. Branscomb, Dr. Cooke, Dr. Cota-Robles, and the others on the Board are trying very hard to do what they can to further these goals, despite the constraints of no money, no organization, etc.

But, I will come back to my initial point. Many of the Congressional and agency activities are bureaucratic bandaids for what is a much more broad and fundamental problem concerning the participation of minorities and women in science and technology.

The way this broader problem was crystallized for me was in Gerald Holton's Jefferson Lecture in the Humanities in Washington this year.

It was the first time that a scientist ever gave this prestigious lecture in the humanities. Holton chose the fairly familiar sounding title, "Where Is Science Taking Us?" That has the ring of a happy little science lecture that you might expect at the museum or library discussion group. You can imagine such a lecture. I'm sure: We are going to explore planets, understand DNA, find new atomic particles, and so on.

And, in fact, Holton touched on some of these subjects at the beginning of his lecture.

Then, however, he stressed that there was a much broader issue to consider. He had a more serious thought in mind and was, at least from

what I heard, warning of possibilities of a dangerous and bleak future for science and society as a whole.

What I felt he was saying is that science and technology right now could also take us into a fundamentally unstable *social* situation. By allowing a narrowing of the pool of people who are trained or even literate in science or technology, the science community is facilitating the creation of a very narrow elite, a very small group that controls the knowledge and power that more and more each year is becoming the leverage that really counts in society.

Who understands, controls, and participates in activities related to information technology, satellite transmissions, communications, and computer data banks? Who knows about genetic engineering, modern agricultural technologies, and revolutionary changes in materials engineering? That's the direction toward which the power in American society and world society is flowing.

Holton is not just a scientist. He is indeed a fine physicist, but he is also a noted historian of science.

I believe he was speaking primarily as a historian when he warned that, in the past, when any large group of people feels disenfranchised from the tools of power and the capacity of protecting their well-being, they are going to be very dissatisfied. They will almost inevitably strike out against the elite that holds those tools of power, even if it can be shown that it is against their self-interest or even suicidal.

He pointed out that the power of science and technology is very similar to other kinds of power, and that science cannot expect to survive the jealousy of the broader segments of society if it does things that concentrate its power and control into the hands of a small and fortunate elite.

In this context, he wasn't talking really about broadening the base of science participation for the purpose of serving of society, but for the survival of science itself. Of course, that's the kind of language that really begins to get scientists thinking.

And, unhappily, he pointed out that the actions that we are taking right now probably are doing exactly the opposite of broadening that participation. We are cutting off science education programs in the Science Foundation, and expecially turning away from those which address the science education base in primary and secondary schools. These are keys to public science literacy, and also to opening the opportunity for science careers to those traditionally excluded from these fields. In the long run there is a hope that stronger state and local efforts, or private sector support, will fill in some of the gaps left by shrinking federal initiatives. But there are few signs that we are putting in the necessary effort to make a smooth transition to a new, healthier, and more broadly based national science education strategy. Instead budget shock and neglect seem to be the main management tools, with results of program disruption and waste of promising initiatives. Unless we change course soon, and give broad science and technology literacy the emphasis it deserves, we will almost certainly aggrevate the alienation Holton warned us is growing between the scientific elite and society as a whole.

Women and minorities especially have to protect their positions in a technologically advanced world by being able to share in access

to these tools of technological power. If they don't, they will be left behind. The position paper for the conference states this warning very well, and I think we would be foolish not to heed it:

> The preparation of minorities and women to enter the fields of science and technology is essential in order to mitigate against their increasingly becoming members of a technologically obsolete labor pool. Further, their presence in policy and decision making positions is vital in order to protect the welfare of minorities and women, and to realize the contributions these populations have to make to the society at large. If the development and application of technology is to be directed toward humane and peaceful objectives, ours are voices that need to be heard.

I think the answer to this fundamental problem is for the "scientific community" itself to face the fact that it is in its own vital interest to avoid the alienation from its culture of large segments of the population. Women and minorities have historically been most vulnerable to this alienation and building of their participation in the scientific enterprise must be a high priority effort. This is not only, or even primarily, for the sake of "fairness", nor for the sake of strengthening the nation's science talent pool. Instead, it is to insure that the appreciation of the value of science and technology is permeated throughout our culture—a matter of self interest and survival, not altruism, for the science community.

In suggesting a strong role for the science community itself in this area, I don't want to sign on as a complete believer in the President's idea of "voluntarism" as a solution to national problems in a time of budget stress. I will leave it to the elected Members of Congress to discuss this aspect of current political theory. But, on the other hand, you can see where my own thoughts are leading. I do believe that activities generated from within the science communities are as important to the broader question of public science understanding and participation in the technical enterprise as what NSF or NASA or other government science agencies do. I think that the science, engineering, and technical societies, with built-in national field networks, through their membership roles, have to become much more active. No federal agency can duplicate that network of skilled and community-based professionals. I'd welcome your suggestions as to the best public policy steps to energize and facilitate the activities of this natural network in public science education and understanding. I very much believe in the need to use its potential.

We have already heard some very good ideas. I think those have to be multiplied manyfold. The SEED program, a culturally-neutral high school math curriculum that can be taught by volunteer professionals, is a very good example. It brings the scientist and engineer in contact with the problems of the school system, and the school in contact with the technical person as role model. The National Action Council for Minorities in Engineering, led by Dr. Cooke, is another example of the science and engineering community itself taking on the challenge of broadening technology skills. There are others and their effectiveness is proven. We need more.

Local schools, teachers, and parent groups have to be motivated to realize that they need to give their young people the tools to the scientific and technical power that is beginning to dominate society. We have to start early. It is not going to work by beginning with the ninth grade when many students already have a feeling that chemistry and

algebra are for "some other people" than themselves. Public participation in the technical future of modern civilization has got to start early, if at all.

Th public television scientific program, "3–2–1 Contact" is a healthy societal experiment in bringing a sense of science participation to a wide segment of students at an early stage. Yet it is one of the many cooperative government and private sector activities which are threatened by short-term budget expediencies and rigidly applied doctrines concerning the sphere of legitimate government activities. The tragic illogic of wasting promising and creative investments such as this without waiting for evaluation, or understanding impact, is the fundamental flaw in the kind of crisis budgeting which has captured the political center stage in the last two years.

My last political point is one that may be perfectly obvious to this audience. We felt last year, as we were developing the Science and Technology Equal Opportunities Act, that the women and other minorities had to keep together on this issue if we were to succeed. In retrospect, I believe that just as strongly now as I did in the beginning. Had we not had a minorities and women in science initiative, as opposed to a women in science or minorities in science, we wouldn't have gotten the support we did. The coalition of women and minorities, working together with similar though not entirely identical interests, was much more powerful in getting Congressional attention than would have been either component alone.

My assessment, in summary, is that we are at a point in history where the scientific community, and minorities and women, have a powerful common interest. For science and technology to maintain its leadership role in society, and the broad support of its tradition and goals, it must broaden the base of public understanding and participation in its operations. Minorities and women have a powerful interest in seizing opportunities for that participation, lest they be left in the backwater of a more and more technically controlled society. Government programs and fancy legislative initiatives may or may not play a constructive role in opportunities for that broader support and participation, but I hope that the overwhelming self interest of all involved will lead to creative initiatives in any case.

Thank you once more for the chance to appear before you.

Dr. ROSENSTEIN. I'm supposed to present a few summarizing remarks. Looking at the breadth of this panel and the number of topics we covered, I despair of doing that in the time that remains.

I believe, however, the panel discussion has explored the breadth of the problem. It shows that there are large numbers of diverse organizations and institutions, each working on a part of the problem and perhaps it highlights the need for interacting networks, greater cooperation and some means of bringing together all of these activities.

I must admit that when Dr. Moss described the limitations of science as no social goals, no money and no organization, I did fear for science at that point.

I believe we also looked to the basic issue that is part of this conference and that is the restriction of access to power in society. I am very glad that this is the first of a series of national seminars because in the end, it is this problem of access to power, influence, and the resources

of our society which is the basic issue that faces minorities and women today.

I thank the panel.

[Applause.]

Dr. ROSENSTEIN. We have, I guess, about 10 minutes for questions.

QUESTION. My name is Pat Ocurra. I used to be an engineer turned a clinical psychologist, so I bring both areas here.

It is a little disturbing to me that no one has mentioned the whole matter of behavioral and social sciences.

In the last decade, I think we have made some progress in the whole area of representation, access and training, in terms of enlarging the pool of behavioral and social sciences for minorities and women. If we are talking about coalitions, I don't see how we can leave that group out entirely. We have to have both hard and soft sciences in order to form this coalition that everybody is talking about.

With the shortage of funds, and with the restrictions on social science research and all the things that are coming down the pike and if Congress or the administration has their way, [last week they knocked a few more dollars off hard science, research] we are going to be squeezed all the way around.

Without a coalition of all scientists, whether they be from hard, behavioral or soft science, we are not going to get very far.

Dr. PFAFFLIN. I wanted to make a brief comment. I am a psychologist and I very much share your concerns. It is quite true that the recent cuts in support for the behavioral sciences and social sciences have impacted on the concerns of this group especially heavily, partly because we have been legislatively successful in getting minorities and women into the social sciences.

Furthermore, research in these areas has been crucial to progress for minorities and women. If we did not have the data on the status of these groups and on the effects of various programs in changing the lives of these groups, we would not have been able to achieve nearly as much as we have been able to achieve.

So, these cuts are doubly damaging in their impact, both on the groups of scientists involved and on the whole population in question.

Now, I will say that in fairness to our colleagues in the hard sciences, in spite of the very severe pressure on funding in all areas of science, groups like the AAAS, have supported additional funding for the behavioral sciences.

And, I think that in this sense, we have something of a coalition between scientists in different areas. I certainly hope that we will also have a similar coalition among all the groups of scientists in those areas who are affected.

QUESTION. My name is James Ely.

One of the specific things that I think could come out of this conference is to strengthen those things that now work and have been working in relation to what this conference is about.

Mr. Charles Hughes spoke of one specific area that has been working, even though he did not quite speak accurately, in that he said that he would name six predominantly black engineering schools, and he named five. He left out one, Tennessee State University, which happens to be my alma mater, and which happened to have produced the 1981 outstanding young electrical engineer in the country and

the 1978 best electrical engineering student in the country, was female, by the way. But that's not my question. [Laughter.] [Applause.]

QUESTION. The main thing that I'm interested in is that industry and Government look at all of the problems that were mentioned in the morning session: lack of adequate preparation and all of the socio-economic problems, that the historically black engineering schools have been overcoming for decades.

So what I am saying, in a nut shell, is that Dr. Moss and, particularly Congressman Dymally, must not let the goose that lays the golden egg, the black professional engineering schools, be hurt or harmed in the present environment.

I'm saying specifically that out of this conference one of the things that should come forth that ought to be placed by everyone that represents every organization here is that there is one particular segment of this society that is already working and meeting this particular goal and that everyone in this room should coalesce to protect the concept of the predominantly black engineering school until such time as fundamental changes are made in this society which maybe would obviate the need for predominantly black engineering schools.

[Applause.]

QUESTION. I am Howard Adams. I run the graduate engineering consortium.

I want to speak to students who are interested in graduate study. I represent a large segment of minority students. I cut across the whole group. I represent Hispanics, native Americans, and blacks who want to go to graduate school.

I hear that we don't have sufficient numbers. Let me tell you the numbers are there. I get far more applications than I have moneys for. These are excellent students.

As we start talking about this, I would like you to take three things that we have found to work very beautifully for our students. One is that the grants need to be portable. They do not need to be tied to schools. We give a lot of money in research and development but they do not find their way into the hands of minority students. I get students to apply to our programs who have straight 4.—4. scales who nobody has asked to stay and work. When it does get to minority students, it costs too much to get it there.

We talk about giving money to school, to a student and to a professor to work with the student. We can deliver much cheaper than that. We need to talk to people sitting in this audience who work on shoestrings. They get better than 90 percent of every dollar that you give to students. That's what we do. We need to make sure that the money gets to the cause.

The third thing, we need to look at is different criteria. I still hear people talking about how you have to make so much on the board scores, you have to make so much on GRE, and have such-and-such a grade point average. That's not true.

We are sending students to school and they are coming out ahead of the class. We don't look at test scores. Yesterday I talked to 12

students at MIT. They cut across a whole racial group. They were finished ahead of their class. We don't need to do that anymore.

We need to do something about networking. Even as we put this money out, we don't tell how to access it. Minority people do not know how to get to the money. We write the guidelines in such a way that we can't find out about it because we are not inhouse where the guidelines are put out. By the time we find out how to write for it, the money is already gone. We need to change that.

Finally, as you do this, I would like sometime to come to one of these things where people would get a chance to tell you about some of the things they are doing on some of these shoestrings, because there are some projects out there that are working well and we can tell you how to do some of them without expending a lot of money if we could get our hands on some of it.

Dr. ROSENSTEIN. Congressman, I assume you are listening to all this?

Representative DYMALLY. This is good.

Dr. ROSENSTEIN. We ought to have the panel sitting down there with the audience. It sounds like the solutions are coming from the audience and the problems from the panel.

Let's have some more solutions.

QUESTION. Lincoln Hawkins, Bell Laboratories.

I want to make a comment, something I have heard from the panel. This panel is involved with getting minorities and women into the organization, a fine purpose.

But I suggest that in this process we pay very careful attention to those that we bring in to be sure that upward mobility is available to them, that they can move in the organization. For if we do not, at some point in time they very soon will look at this picture and see that we have all of our minorities and women at the lower rungs of the ladder and maybe even trapped there.

If this happens, rather than accomplish affirmative action, we have established the status quo of women and minorities as second-class personnel.

QUESTION. I am not sure that my comment will merit a response from the audience, but I think I would like to make this comment to Dr. Lawson. This is in reference to one of the programs that you made mention of that is ongoing at NASA. That is minority schools engaged in proposal writing, a proposal competition among themselves.

You are going to only include those minority schools who have demonstrated capability to perform competent research. I, myself, have problems with that kind of approach to solving a big problem.

No. 1, if that minority school has demonstrated that they can perform competent research, then I would say remove the stigma that you constantly look at the Ivy League schools and other schools as the only schools that can do competent research and treat the minority school who has demonstrated that they can do competent research, if I understand what the definition of competency is, and let them compete among the other schools.

I think we are going down a detrimental road if I stick my chest out at my brother school across the street and say, "Yes, I beat you out on the last grant that was submitted by NASA."

I think that there are probably some alternative ways and much better approaches to solving that kind of problem than to gloss over the way you mentioned.

Dr. ROSENSTEIN. I hate to ask the former president of a university to make a brief response, but would you try a brief response?

Dr. LAWSON. When somebody makes an excellent objection, the best thing you can do is not respond.

Since I have to respond, I don't believe that what we are talking about does what you just said. In other words, we aren't excluding those who didn't fall into the two or three universities that would be granted this 5-year or long-term support. We aren't excluding the others from being considered for support in the same way we have been doing all along. They would still qualify for participation in the research program at NASA. They wouldn't be just tossed out. We are trying to develop a few to push them up to the point where they can do what you just said, let them eventually participate in the mainstream of research activity.

Maybe 5 years may not be long enough and the money may not be large enough, but what we are implying is that given proper support over a proper length of time, many of the minority schools will be in just as good a shape as some of the majority schools.

For example, the Old Dominion University which happens to be located near the Langley Research Center. Well, 20 years ago perhaps nobody had even heard of Old Dominion. But they have been able through support, just by the accident of geography, to strengthen themselves in such a way that they can compete against the other schools, MIT, Cal Tech or whatever, in a way that emphasizes the fact that they do have research capabilities which qualify them for that kind of consideration.

So, the other thing I wanted to say is we are talking about our experiences with these schools, too. We are talking about a restricted number of schools that have participated since 1968 in the Agency's programs.

But I think your remark is well taken, however, we are not excluding those institutions from support here at NASA.

Dr. ROSENSTEIN. I think we have time for one more question.

QUESTION. Cornell Rigby.

We have a point to make or comment to make about one thing that was mentioned. I probably should direct this to Dr. Moss.

Several people have mentioned that we need to improve the scientific and technological literacy among the lay sector which is fundamentally and basically all of us.

The point I want to make is not only should we try to improve basic scientific knowledge of the public. We should also get some feedback from the private or public sector, the mass of people that should begin to set some of the goals that we as scientists and technologists should begin to listen to and begin to work to as we factor out all of these various approaches that we have.

I would like someone to at least comment on some of that. How can we be better listeners as an elitist group to the masses who are also trying to generate goals and from whom we would draw the human resources to fill out these goals?

Dr. Moss. I think you are making a very important point. I don't know if you noticed that this spring, there was some testimony for the appropriations for NIH which were, of course, being cut like everything else. A delegation which included, I think, six Nobel prize winners came down to talk to the Appropriations Committee. The chairman of the committee said, "Look, you are talking to the wrong guys. We are all for funds for NIH and so on, but it is our constituents back there who have to understand this."

I started out my talk by saying it is good to push the legislative body from the outside. I think most of the people involved in the politics of science and technology now feel that one of the main constraints in the support of science and the appreciation of the value of science is the lack of public stress on that area as a key priority for society.

So, I think that's why it is in the self-interest of the professional societies and the trade associations and other science groups to really deal with the problem of public literacy and public science understanding.

Scientists come to us because they are frustrated. They may be alarmed that there is going to be a moratorium on experiments with recombinant DNA or some similar restriction. How can the public be so stupid? But I'm trying to stress that if there is no attempt to bring a fundamental understanding of these issues to the public, they are not going to make very rational decisions in any kind of plebecite or budget decision. So I think your point is exactly correct.

Dr. ROSENSTEIN. I think we could probably go on for the rest of the week. Perhaps we have hit a very responsive chord today.

I might suggest that when future seminars are held, it might be useful to have some workshops so we can get a closer interchange.

I thank the panel, once again, for excellent comments.

Representative DYMALLY. There will be a little more than an hour for Q-and-A and discussion. So, don't leave.

May I invite the moderator and the panel, itself, to come up for the last panel, the Role of the Family and Community in Science and Technology, Dr. Cobb, Dr. Chavis, Dr. Johnson, Dr. Rosenstein?

It is my privilege to introduce the moderator of the final panel. I knew the moderator of this panel before I actually met her. I knew about her when I served on the board of regents for the University of California, which held most of their meetings in northern California. I knew about her when I served on the board of trustees of the California State University which held most of the meetings in southern California. And I knew about her subsequently as a member of the National Science Foundation.

Recently, someone said to me if anyone comes from California, they will understand how it is a black woman can end up heading a university in Orange County. That is the headquarters of the Birch Society. I said to the person, "If you have the conservatives at Stanford supporting you, the moderates at the University of Southern Cali-

fornia supporting you, and the liberals at the University of Southern California supporting you, you couldn't lose." That is how Jewel Cobb became president of California State University, Fullerton in southern California. Let me introduce you to the president of the newest medical school in the United States, the Charles Drew Medical School, Dr. Haynes. The school just happens to be located in the 31st Congressional District. Thank you very much.

STATEMENT OF DR. JEWEL COBB, DEAN, DOUGLAS COLLEGE, NEW BRUNSWICK, N.J.; DR. BENJAMIN CHAVIS, DOCTOR OF MINISTRY, HOWARD UNIVERSITY, WASHINGTON, D.C.; DR. DAVID JOHNSON, CONGRESSIONAL FELLOW, AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE (AAAS), WASHINGTON, D.C.; DR. BETTY ROSENSTEIN, EDUCATOR AND CONSULTANT, LOS ANGELES, CALIF.

Dr. COBB. Good afternoon. I am, indeed, very much honored to have been asked to participate as chairman of this distinguished group. You, as honored guests, and our panelists as a panel are experienced in the subject we are discussing. Particularly all of us are concerned, indeed immersed, in the serious issue of the underrepresentation of minorities and women for our national needs. We also ought to reflect on the fact that the Congressional Black Caucus has, like our minority population in general, only recently been aware of the importance of the subject of science and technology. There has been, if you will, an enlightenment.

I would particularly like to compliment Congressman Dymally. We have a mutual admiration society between us. Over the past 7 years, the time I have been associated with the National Science Foundation, I can tell you that no member of the scientific congressional or Senate committees has seen fit to call a seminar series or conference on the subject presented today. I would hope that all of us write to the members of the House Committee on Science and Technology to say how much you appreciate and have profited from the seminar. I hope that you would also write the same note to the Senate Committee on Commerce, Science, and Transportation.

It is indeed a very positive concept. I will refrain from talking about other components of the topic because we are here to hear from our specialists. There is certainly no debate on the importance of the family and of the community on how our children develop and how in fact all of us have developed as adults. And so, it is timely that we hear first from a member of the community, a very strong leader, a very brave leader, the Reverend Doctor—or shall I say Dr. Benjamin Chavis, who in fact has been and is now a leader in the movement of churches, defining his task beyond the walls of the church and has been in fact an activist over the past years. He is currently the department director of the United Church of Christ Commission for Racial Justice in New York. He is also a national representative for the National Black Independent Political Party. He holds a master's degree in chemistry and a doctor's degree in ministry from Howard University.

Our second panelist will be Dr. David Johnson, who is a congressional fellow with the American Association for the Advancement of Science.

Our third panelist is Dr. Betty Rosenstein, educator and consultant in Los Angeles. She holds a master's degree in Spanish with a doctorate in adult education from the University of California-Los Angeles. Over a period of years, she has taught there and has done extensive research on the needs of women and is well known for her community leadership. Much of her work in fact has been translated into Spanish for publication.

It is my pleasure indeed to introduce to you Dr. Chavis.

Dr. CHEVIS. Thank you very much. To Dr. Cobb and the other panel members and to all of you who have come out this evening to join in this most important panel discussion, first I would like to thank Congressman Dymally for being primarily responsible for providing this forum.

As a member of the Congressional Black Caucus, I bring you greetings from the United Church of Christ Commission for Racial Justice and also from the National Black Independent Political Party. I think my remarks will probably be slightly different from the others that have been given today. Mine will be sort of philosophical. I do intend to touch on some specific points, to raise the questions of family and community from a black perspective in light of the vast scientific and technological achievements of American society necessitates raising the question, to what extent has science and technology aided the struggle to eliminate black family and community oppression? Do the fields of natural and physical science have similar responsibilities as the social sciences in analyzing and confronting societal injustice?

My answer is yes. The sector of society or that sector of society that provides the scientific and technological genius for achievement cannot and should not retreat from assessing the impact of their work.

In other words, the impact of science and technology is political. It is more than just a matter of getting more blacks into the system. The system needs to be changed, needs to be transformed into a nonracist system, into a nonexploitative system, into a justice-seeking system.

Way back in the 17th century, the philosopher Descartes is quoted as saying that "science will make us the masters and processors of nature." I think that quote has been transformed a little bit here in America, particularly in light of President Reagan's speech last night, that science will make us the masters and the processors of the world. I believe that certainly our goal today should be to raise the inadequacy and the disproportionate number of blacks in the scientific field, and the way the doors have been systematically shut. Although some doors are opening now, they are not opening wide enough and not enough blacks are going through. But we also must raise the question of what is the overall impact of increased numbers of blacks in the scientific world? It is true in the last 20 years, there have been many signs and many events that have brought some progress toward social justice for the family, particularly the black family and other minority families and for many black communities across this country. But the fact still remains there is a vast disparity between the kind of achievement that has been made in the scientific and technological field and the lack of achievement toward eliminating some of the social ills of this society.

Another philosopher once said you can judge a society by looking into its prisons rather than looking into its laboratories. As one who has spent considerable time in American prisons, I want to report to you that this society at least as represented by its prisons, still represents a society that does not intend pragmatically from a national governmental level, even in the private sector in many cases, to address the question of racism seriously. I think that we would be derelict in our responsibilities if we have a panel on minorities and women in science and technology without forthrightly raising the question of racism in light of how this issue or this social problem is permeating all of our society including the scientific field.

The point, which is only one point I want to make, is that we need an alternative future than what is presently the handwriting on the wall, so to speak. Albert Einstein once said that you cannot, from a scientific perspective, purport to be for peace and simultaneously prepare for war. As I listened to our President last night, while it was not a declaration of war, it certainly was a declaration of war in terms of where the priorities of our Government presently lie. Those of us who are in the scientific field or who have been and gone over places must seriously question the utilization and the manipulation of scientific achievement in America. Let us not make the vast progress that has been made be used for the purposes of worldwide exploitation and imperialism.

There are many problems here that we need to solve—health problems, and social conditions. If we would use our national ingenuity to solve some of our pressing societal problems, then I believe that this land would be a better place. But I have to deal from reality and one of the reasons why there is in fact some disillusionment in many black communities and in many families on the question of science and on the question of technology is because of the performance in the social arena by natural and physical scientists in terms of utilizing their skills not only for the technical achievement, but to confront government, private and corporate structures of their social responsibilities.

If during the last two to three decades we as a nation can produce the most sophisticated bombs, the most sophisticated warfare, if we can send someone to land on the Moon, bring some of it back, if we can send satellites to far-off, distant planets to bring back crystal clear color pictures, why not can this ingenuity and this genius, which it is, not be used to tackle America's single most serious problem and that is to tackle the unwillingness to treat each American citizen as a human being without regard to race, class, or now even sex.

[Applause.]

Dr. CHAVIS. I'm not so naive to think that I can preach to scientists——

[Laughter.]

Dr. CHAVIS. I know most of you have your mind made up about the world. But I invite you to come visit where I live now, in Harlem, N.Y., to see a place that once was a renaissance of black productivity, now crumbling into shambles. Not because the families that live there—or because the community itself does not want to uplift itself out of the mire of oppression but because of the systematic governmental policies that keep it in check in the myopia of genocide.

When I hear talk of genetic engineering, at least from a community perspective, it is in fact a code word for us for genocide. That needs

to be discussed because one of the problems in the community is that there is an unawareness of what is really happening in the scientific and technological fields. From a black community perspective, the only contact we have with technology is when the police department comes with a new kind of tear gas armored vehicle or helicopters. And so, in a very real sense, many black communities and many black families have been the victims of the inadequacy of science as is presently manifested in the American experience. It does not have to be that way. If this society is to be whole and it certainly can be, then brothers and sisters from all stratas of life are going to have to work harder together. The challenge has been made.

As I said before, we need an alternative future because the present future is one of self-destruction. Let us not only project our scientific and technologic intent as we carry out the research, as we carry out the experiments, just for our own gratification as a nation. But the alternative future must not just be a national world. It must be worldwide and international.

One of the things we are locked into more than ever is a world situation that we have to share. We have to share, yes, our achievements, or else we have to share our common destruction as humanity. The single most pressing issue worldwide—I said racism was a domestic issue—but worldwide is the issue of peace. We are not going to be able to have any families or any communities if we allow World War III to start. No scientist will probably start it, but the benefit and the product of scientific achievement will be used to destroy us all if we allow that to happen. The politicians must be called into check. I say that there is one excellent majority that has some potential power in this land and that is the scientific and technological fields.

In other societies, it is the scientists, those who have in fact made achievement who have the forum to engage in constructive criticism of their respective societies. I do not see that happening here in the United States. One of my criticisms of the church is that we have state religion. My criticism of science and technology is that we have state science and state technology.

Thank you.

[Applause.]

Dr. COBB. Thank you very much, Dr. Chavis. Dr. Johnson will now come forward, please.

Dr. JOHNSON. I think it is interesting that the title of our panel discussion is not "The Role of Science and Technology in the Family and in the Community." Rather, it is the other way around: It is "The Role of the Family and the Community in Science and Technology." Were the title stated in the former way, it would be easy to make up a list of the ways science and technology working together have influenced the family and community.

Last Christmas they gave us the food processor. The Christmas before that, it was the home video game. Then before that, it was the digital watch, the microwave oven, and on back over the years to cars, television, and radio.

I gave that list only half facetiously. The list illustrates that the relationship of the family and community to science and technology has been that of consumer to producer. I want to center my remarks around just one of the products of science that our communities consume. That product is information. My brand of science, social science, is in the

business of telling people about themselves. We tell people what it is like to be normal, and we prescribe to people what they must do in order to ascend to normality.

It is in this function of science as a producer of information about ourselves that families and communities, most especially black families, Chicano families, Native Americans and women, must begin to play a role other than that of simple consumer. Why? In part, because it is still only occasionally the case that members of these groups are numbered among the scientists who tell the world not only what blacks, Chicanos, Native Americans and women are like, but also what these people should do or have done to them if they are ever to achieve normality.

I could say that what we need in order to become better consumers are more black, Chicano, Native American, and female scientists. And that is true enough. But achieving just that would probably not be enough. I think it would not be enough because all scientists undergo a number of years of intense indoctrination that is aimed not only at teaching them to use the tools of their craft, but also at initiating them into their particular science's club with its prescribed set of rules and its particular way of viewing the world—its own normality, so to speak. Blacks, Chicanos, Native Americans, and women were not present within the social sciences when the world views of those sciences were being formed. Therefore, simply pumping this element into the scientific community need not necessarily change the information these sciences produce about our families and communities.

We, as members of our various communities, must learn to be discriminating consumers of information about ourselves. I want to tell you a little story about myself. Nearly all psychologists at some time in their training take a course called "Abnormal Psychology." That is the class where they describe all the various mental illnesses. When I used to sit in that class, I remember I would hear the professor describe an illness and I would say to myself, "My gosh, I've got that!" By the end of the semester, I just knew I was a schizophrenic manic depressive with absolutely no superego control over my id. But that was really OK because I was good enough at projection as a defense that I could make everyone else think it was they who were sick.

[Laughter.]

Dr. JOHNSON. Well, I know now that I don't have all those things. I'm really just a type A personality. The point I'm making—and I am making a point—is that if we as members of our families and communities are to be benefited by the information that social science produces, we must begin to be selective about the particular information we choose to apply to ourselves or that we allow to be applied to us.

In some cases, it may be that none of the available information truly fits our situation. Black people are not a standard deviation less intelligent than white people, for example, though some social scientists might convey that impression. The average black family is not a single parent household, though some reports of research would lead one to think that is the case. The newest piece of information is that women are innately less capable of doing mathematics than are men. Do you believe that?

When information that clearly is not suited to our situation is presented to us, it becomes our responsibility as discriminating con-

sumers to reject misinformation and to demand of scientists that they give us information that rings true, information we can use to make our families stronger, our communities better places in which to be.

Science is really just a set of fine tools, tools that can be set to many purposes. But science was meant to better the lives of humankind. Our role as consumers is to insist that these fine tools be set to the purpose for which they were meant.

[Applause.]

Dr. COBB. Thank you very much. Dr. Betty Rosenstein.

Dr. ROSENSTEIN. Thank you.

First, I want to thank Congressman Dymally for his invitation to participate in this challenging conference. But when I see where he put me on the program as the last speaker following all these fantastic panelists, I'm not sure he did me a favor.

I also wish to commend the Congressional Black Caucus for identifying a serious problem and attempting to seek realistic solutions to that problem.

In the time alloted to me, I hope to place the issue of this conference in a different perspective than that upon which today's deliberations have been based: namely, the implication that minorities and women must enter the sciences and technology in order to become part of the mainstream of American life.

On the contrary, I hope to demonstrate with several statements that the answer for minorities and women lies not in the sciences and a loosely defined "technology," but in the professions.

While we applaud the Black Caucus' recognition of the needs of minorities and women to achieve economic security, to enjoy career mobility, to become responsible, contributing members of our communities and in turn, the country's need to utilize the long-neglected resources of a major portion of its population—and attempt to find a solution using science and technology as a career goal, is doomed to fail and in the end will do a great disservice to the people who should be served.

Unfortunately, our communities have found it far too easy to succumb to the siren call of science. The public and its leaders themselves have become mesmerized by the national myth which proclaims science and basic research, the ultimate solution to all of the Nation's problems.

"If only minority children in general and little girls in particular—would just study more math in school." Then they could become budding scientists and fame and fortune will become theirs as they are welcomed into middle America.

Well, it is time for a reappraisal of the situation. Starting right in our own communities, in each household, an educational process must begin with recognition by leaders in the church, the local business sector, the school, youth groups, parents—that if men and women are no longer to be excluded from the future, they must become part of the decisionmaking segment of society and that can only happen by entering the world of the professions.

Let's look at the facts. Job opportunities in science are decreasing. In this era of economic limitations and increasing fiscal conservatism, there is every indication that despite the natural preference for—and the mystique that surrounds the sciences, career opportunities for both male and female scientists will steadily decline. Universities and col-

leges that formerly provided havens for those engaged in scholarly research will offer still greater competition for the few remaining academic positions as the availability of these "research retreats" decreases.

It is unlikely that the situation will improve as job opportunities become even more scarce when it is increasingly evident that the Nation's demand for solutions to complex social problems, cannot be found through pure research whether in industry or in academia.

Two, the Nation's complex social problems call for professional solutions. It has been well-established that the arts and humanities preserve the culture and the heritage of the race and from them we derive our value systems. Science seeks knowledge for knowledge's sake and in so doing, discovers the laws of nature that often place constraints upon solutions to social problems.

The professions on the other hand, allocate the resources and seek to improve the many environments that determine the quality of our life. It is those men and women acting in a professional mode that are in effect "society's decisionmakers." If minorities and women therefore are to participate in societal decisonmaking and are to impact upon national life, and I believe that it is what this is all about, they cannot be educated with only science models but must at a very early age by their families, the church, and others who influence them, be directed toward and trained in the professional mode.

Three, math and science are essential to most educational programs. However, to avoid the frustration and disillusionment that can only come when science is the ultimate goal, minorities and women must be directed toward careers in the professions.

Four, science has in the past and will probably continue to underutilize the resources of minorities and women. A response to technological innovation to productivity and to all of the other critical social and economic imperatives that concern the country can only be found not from those directed into still more basic research, but from those who bear the responsibility of allocating the physical, the health, the intellectual and the other resources that affect the quality of national life—those educated in the professions. If Government is truly and sincerely committed to bringing minorities and women into the mainstream of social action, it is the doors of the professions that must be opened to them not just the scientific doors which can lead into dead ends for the skilled and the talented.

Perhaps community leaders, teachers, and parents should begin to ask themselves the following: One, which careers produce our political leaders? Certainly not the life sciences. More often than not they come from law and related professions.

Two, which careers produce the men and women responsible for our health environment? Certainly not biology and physiology. They come from medicine, nursing, public health.

Three, which careers produce the men and women responsible for our intellectual environment: certainly not botany, bacteriology. They come from our teachers and our other educators.

Four, which careers produce the men and women responsible for our civil liberties? Certainly not physics and chemistry—but law that produces lawyers and judges.

Five, which careers produce men and women responsible for our physical environment? Not zoology and genetics but architecture.

Six, and finally, which people produce those responsible for our spiritual needs? Certainly not the paleontologists or geologists—but our ministers.

Let's take a brief look at some data extracted from a current statistical abstract index. In a given year such as 1979, for example, there were approximately 802,000 Americans working as scientists. In the same year, well over 10 million. in fact, nearly 11 million adults were employed in the professions. This number does not include another 10.5 million employed as business managers and administrators (exclusive of farm management.) We see here a ratio of professionals to scientists of 25 to 1. We must now ask ourselves why then are we so anxious to encourage our minorities and women to go into science and technology when the obvious way to plug into the system is by means of the professions?

My next statement begins with a short personal anecdote. I promised myself when I became a grandmother I would not burden my family and friends with stories about my grandchildren. But on occasion, I have been known to make an exception like now, when I have a captive audience.

Some years ago when I was returning home from a day with my 4½-year-old granddaughter, I asked her the question that I often ask children when I have a chance.

"Heather, what do you want to be when you grow up?"

"A babysitter," replied my 4½-year-old granddaughter. She then quickly explained, "That is only when I'm 15 or 16."

"When you are 20 and 21, really grown up, what do you want to be?" I asked.

"A teacher," replied my 4½-year-old granddaughter without hesitation.

"A teacher!" I exclaimed. "That's nice, but, Heather, how would you like to be something different, something special for you? How would you like to be a doctor?"

"No, I wouldn't want to be a doctor."

"Why?"

"Because I don't want to take care of sick babies."

"That's a good reason. Maybe you'd like to be an attorney," I suggested. She didn't know what that was. "Well then," I said, "How would you like to be an engineer like your grandpa and your uncle?"

She looked at me then with her big beautiful eyes and said, "But Grandma, girls can't be engineers."

With that I slammed on the brakes, pulled over to the curb, parked and turned off the motor, looked at her and said: "Heather, I'm going to tell you something that's probably the most important thing I shall ever tell you. Every time we get together I'm going to repeat it. Girls can be anything they want to be when they grow up. Now, I want you to say right after me: Girls can be anything they want to be when they grow up. Do you understand what I'm saying, Heather?"

She looked at me and quickly responded: "But Grandma, they can't be boys."

In the 5 years that followed that incident, I have come to realize that the real problem is not being anything you want to be when you grow up. That comes later. What is important is first finding out what you want to be and why and what your chances are for success.

As I lecture to young people and their parents I find that most of them don't know what the professions do. Some children may think they want to be an engineer, for example. However, those same children don't know what the job entails. How you get to be one. What you do when you are one. But then, neither do their parents, their teachers, and even their counselor. If they have one, that is.

So, to address the question of what can the community do, I submit that the solution to the underutilization of minorities and women lies in a professionally designed, educational program conducted at the Federal level.

The specific responsibility for the development of a mechanism directed toward the entry of minorities and women into the professions has been incorporated into a bill introduced by Congressman George Brown and Congressman Mervyn Dymally. This bill, called the National Professions Foundation Act, would do for the professions what the National Science Foundation has done so admirably for the sciences.

In support of this legislation, I recommend that individual communities play a major role in supporting the effort. We are probably all personally familiar with some successful, career-oriented program led by a community school, a church or youth group. But these are isolated projects that still leave large segments of the population without the guidance that they need to make meaningful career choices. Therefore, these programs should become part of a larger network. What I am recommending is a mechanism by which teachers, parents, students, religious, and other community leaders can be provided with complete and current materials and information about the professions—not just science and technology. The material should be disseminated at every grade level beginning with kindergarten and continuing through high school. My experience with Heather demonstrates that junior high school is too late. Elementary school is too late.

My final recommendation is that each community sponsor a series of programs to look at the question of professional careers for minorities and women. These workshops conducted throughout each State would share a common set of goals and criteria for achieving them—goals previously agreed upon by a steering committee perhaps originating from this very conference.

A major outcome of these community workshops in due time would become a support for a Washington based professional foundation not unlike the National Science Foundation. One function would then be that of seeing to the professional design and coordinated distribution to individual communities of innovative educational materials in book and film to deal with the following matters:

First, negative stereotypes that prevent minorities and women from identifying and achieving professional goals.

Second, the development of innovative materials and improved teaching techniques for motivating children to select at an early age and then continue to enjoy math and science classes in preparation for professional careers.

Third, design of materials and equipment at every grade level so that educational and psychological requirements for all professions and science and technology, along with employment opportunities and descriptions of actual work involved for each career becomes readily available to students throughout their school experience.

Fourth, redesign of tests that more accurately measure achievement and better reflect the aptitudes, skills and talents of minority children and young adults.

Fifth, develop special training programs for personnel from church, youth groups, senior citizens, volunteer parents, and practicing professionals to serve as career counselors, thereby supplementing the efforts of overworked school counselors.

Sixth, development of easily updated, computerized counseling programs that offer information on career choices, entrance requirements, employment opportunities.

Seventh, organize a talent bank of practicing or retired professionals—not boxers or rock and roll artists—who can serve as role models in their communities. A short, intensive training program should be designed to help successful minority men and women through film or in person to encourage people to go into the professions.

In closing I wish to reemphasize that the only answer to the underutilization of the majority of our Nation's most valuable resources—its minorities and women—lies not in basic research and science but in their joining society's decisionmakers and becoming a part of that growing segment of men and women who are responsible for the allocation of resources that affect the quality of life in every community in America. It is not an easy task, but with today's conference we have taken a baby step forward. I feel confident that with the understanding and support of such legislators as Congressmen Dymally, Walgren, and Fuqua, along with the Black Caucus, we are going to see much progress in the years ahead.

Thank you.

Dr. COBB. In the interests of time, I would like to make only two small comments. Then we will move to our discussion. I would like to say, No. 1, that I think we have a semantic problem in the definition of profession. A profession is defined as the application of a discipline for the purpose of earning one's livelihood, planning a career. There may be I think among us many who are involved in the areas of health and education, science and teaching, including the teaching of science who call ourselves professionals.

That debate, however, I think belongs at another time. But it will be interesting to continue the discussion privately.

I would like, however, to comment about families. I think we all know what families do in (a) protecting children, (b) supporting their emotional development, and (c) in providing a bulwark against the external world at times when children are vulnerable and learning.

Above all, hopefully parents encourage curiosity—the free, unfettered development of curiosity of the kind that we just heard about in Dr. Rothstein's granddaughter. In relation to that encouragement of curiosity, there is one very important point that seems critical.

As parents one needs to establish the process early on of discipline and to be able to make the broad jump between the television program that lasts for 30 minutes with a problem at the beginning and a solution 30 minutes later and no effort to the tedium and the hard work and the concentration involved in reaching that successful conclusion in the real world.

That is in fact the essence of what we wish and hope for, curiosity, discipline and a sense of the steps involved in reaching that final

success. Perhaps we can in future conferences consider the development of "how-to" manuals for parents related to implementing whatever the parent wants for the youngster. Such a manual would suggest a process of monitoring the schools in which they find their children, and monitoring in fact their environment at an early age to create the successful outcome.

I would like now to ask Congressman Dymally if—because we are now 40 minutes after 4—whether he would like to direct the discussion that would normally be a part of this panel, if he is in the room.

Representative DYMALLY. First let me thank all of you and the panelists.

[Applause.]

Representative DYMALLY. Feel free if you want to answer a question that is asked to do so. Let me again repeat that we plan to go someplace with this braintrust. We are proposing some regional conferences and I took note of the role of the historically black colleges with the hope that they will sponsor one somewhere in the South or the Southwest.

We plan to move this braintrust into the general arena of the Congress, both the House and the Senate, and to have a citizens support group to support the congressional braintrust.

We are hopeful that we will be successful in getting a fellow to work with us for the next school year. We plan to publish a newsletter if we raise adequate funds from the citizens braintrust, although I don't anticipate large sums of money.

We have a commitment to take this transcription here today and make a publication out of it which we will mail to all the participants in this conference. I thank you very much.

Now we have an open session. You don't have to ask a question. You may want to make comments.

QUESTION. I would like to make a comment rather than a question. My name is Charles Bush. I am the chairman of the Committee on Minorities and Physics of the American Physics Society.

I would like to emphasize the need for the professional societies to take a more active part in what we want to do also. I would encourage you to include the professional societies in future plans relative to the braintrust. This would include the professional societies not only minority but also the majority societies.

For example, some of the work by the American Physical Society relative to this problem includes the establishing of a scholarship program. This is a scholarship program for undergraduate minority physics students. This program has been in effect for 2 years and now includes twenty students. And second, I would like to just read a resolution which has been adopted by the council of the American Physical Society this past April at its Baltimore meeting.

Resolve that the council of the American Physical Society recognizes the lack of significant levels of participation by minorities and women in science and engineering as a national concern and views with alarm the budget cuts made by the Carter administration in public programs designed to increase such participation.

Be it further resolved that the council supports the restoration of adequate funding to such programs as appropriate expression of national priority. I do think the professional societies are also beginning to face up to the needs relative to minority participation in science and engineering.

Representative DYMALLY. Thank you very much.

QUESTION. Calvin Smith. I just have a question, that is all. I haven't heard it said today but I was curious as to what effect the recent demographic trends, and I am talking about fewer and fewer children reaching college age each year, has on the probability of success for funding education in general and programs geared to the needs of minorities in particular?

Representative DYMALLY. Does anyone have an answer to that? Anyone want to make a comment on that?

QUESTION. I think as it applies to minorities, we don't fit into that category. We have not had an opportunity to participate. I keep hearing that the numbers are bare. That is not in fact a real reflection. There is a drop in overall enrollment of minority students, but there are a tremendous number of students who want to go to college, particularly among minorities and women that have not had a chance to participate before. As we listened this morning, native Americans have not gone to school, not even at the elementary level. Hispanics have not had an opportunity to participate. Blacks have not had an opportunity to participate. If you are talking about elementary school, junior high school, with raw numbers, my information is you can go to any seventh grade class today and count the numbers, and I can tell you now that there will be one who will lose twelfth grade.

In any group of three, we are going to lose two of those. The numbers are there. We need to retain those people so that they are productive, get them into school and definitely into college. We are cutting back on the aid to students at the college level. When we start talking about recruiting, people tell me they can't find anyone.

I find students who want to go to school and there is no place to go. So I don't think that is a problem.

QUESTION. The dropping enrollments can cut both ways. There have been studies which indicate that one of the reasons for the increase of women and particularly older women in the colleges and universities has been the dropping enrollment and therefore the schools have made some efforts in this direction.

I think this is true in engineering. About the only area where there is evidence that some effort was made to include special programs for women was in the engineering schools because of the dropping enrollments.

On the other hand, you have to be careful of this kind of thing because one reported reaction from a dean of an engineering school was that he was very concerned because it had had a 20-percent drop in the enrollment in his classes.

The examination of the figures indicated that he had not had a 20-percent drop but 20 percent of the class is now female. I fear that this would not be limited necessarily to women, either. And so, in the schools—the schools may respond to the dropping enrollment positively but I think we have to be very much on the alert and try and use the changes positively.

The other side of it of course is that with dropping numbers there may be a lack of interest in the near future.

Dr. SNYDER. Just a couple of brief comments. We have been heralding the drop in enrollment for years. It hasn't happened yet. In fact, it continues to rise slightly. We see this each fall as the enrollment

figures come in. And to quote from someone who is not a scientist, a historian I have spoken to recently, claims to have predicted this all along, that when the college age population declines in number, the rate of college going increases.

This is one element we seem to be seeing now.

Another thing that needs to be said about this decline is that it is projected as a short run decline, a decline that isn't real. The so-called shortage of students, however projected, is not anticipated to last beyond the year 2000. We see hills and valleys in enrollment over the next 20 years or I should say in the traditional college age population.

But it is not a permanent condition. What we are talking about in part here is also a long-term perspective. It takes awhile to produce scientists. Now I think also much of the discussion here has been tinged with realism.

You have to make distinctions between fields of science. There are fields for which the immediate projection is not great in terms of traditional academic employment outlook and there are many fields for which the outlook is quite good, some of which were mentioned by the earlier panel this afternoon.

We also have no reason to assume that science is absolutely static, but rather that new fields begin to emerge, into areas in which the demand is tremendous. One of the tables passed out this morning pointed out the higher unemployment rate of women scientists, the higher rate of women over men in a number of fields.

This is true. But it is nonexistent in fields like computer sciences where the unemployment rate for sciences of either sex happens to be zero.

Representative DYMALLY. There are more people from Fisk here than from any other school but I want Tennessee State to know that I am pushing them.

QUESTION. I don't think I need the microphone. I am just going to stand here and say first of all I think Dr. Rothstein's speech was the right sermon in the wrong church, the idea being that what we are about is getting minorities into these fields.

I think that the distinction between science and technology was confused in her presentation as we had an earlier presenter that basically said technology is where the engineers are, if you will.

You were talking to the basic scientists who are seeking new knowledge. The statistics that you quoted basically may apply to scientists, but not in the technological area. But that is not to knock that because we want to get minorities and women represented wherever they are underrepresented, including the professions.

[Applause.]

QUESTION. Now the next thing that I wanted to say is having been trained as an engineer, I like to talk about specifics. What specifically can we do? I have one more specific. Why don't we take the McDonald approach that they just took to drugs? The AAAS and the various other groups, could actually advertise on TV, which everybody sees, the kinds of statistics that we have talked about. The kinds of rewards a good commercial advertiser could demonstrate, are psychological, emotional, and let's not leave out the money, just plain old fat money.

There aren't a lot of poor engineers. They might not be the richest in the world, but they certainly aren't the poorest. By that mechanism you can captivate the interests of a number of kids.

So what am I saying specifically? Two specific suggestions. One is to indeed strengthen those black professional engineering schools. Everybody supports that. Two, let the professional societies here represented consider advertising engineering and technology as a field that is rewarding both monetarily and social-humanistically.

[Applause.]

Representative DYMALLY. Could you give your name again?

QUESTION. My name is James Ely from the Naval Sea Systems Command and also representing the Washington Area Navy Chapter of Blacks in Government.

QUESTION. Clarice Gaylord, the National Institutes of Health. I am glad you said blacks in government. My comment is on something that hasn't been mentioned this morning: the Federal Government hiring of black professionals. I have been at NIH for 10 years and I can still cite the same number of black professionals employed by NIH. It is very low. Five percent at the most.

I don't know whether the Black Caucus can do anything about it, but it seems to me that Federal agencies are responsible for monitoring hiring practices of other institutions but they have not done a good job of monitoring themselves.

I would like to say too that a comment was made this morning that there should be more minorities in power positions. In my job, I am involved in a review of grant applications. If there were more minorities involved in this process, I am almost certain that we could help the other minorities out in the field seeking grant support.

But since Pat Harris has left office and I don't know what Secretary Schweiker's stand is on recruiting minorities, I think we need strong legislative input backing the Federal Government's improving its own hiring practices of minority professional scientists and also in getting more minorities on these committees.

Thank you.

Representative DYMALLY. Thank you. Why don't we start with the Congress first? They are the worst. Yes?

QUESTION. Charles Baskerville, a research geologist with the U.S. Geological Survey. I have two comments. One deals with something someone said previously about professional societies and getting involved in minority participation.

We in the geological sciences thought of this back in 1970. I was then a member of the National Advisory Committee to the then Secretary of the Interior for the whole Interior Department and subsequently wound up working for the Department of the Interior which had nothing to do with it.

The AGI, the American Geological Institute, and all its member institutions, the American Geological Union, the Geological Survey, and the Association of Engineering Geologists, and I am a member of most of them, got together during those 10 years and set up minority scholarships.

They do have minority funding and recruitment and this sort of thing to try to get more minorities into the geological sciences which

covers a whole host of things. So on that score, the geological sciences have been in this for going on now 11 years.

The other thing we talked about earlier, the relationship of one-on-one between scientists. We in the U.S. Geological Survey have been doing this and as someone mentioned earlier, we also need more money.

I think we can do this without having a middleman involved if we support the students directly. This is what's happening with us. I have in the last 2 years four students, one black male, one black female, one white female, and one Hispanic.

My point being that these students started with me working on research projects as undergraduates. All four of them are in graduate schools: Two in Columbia, one at Columbus University, and one in the city of New York.

These students were supported by the Survey. What we need is probably every agency that would like to have an internal-type program where students in, say, senior high school level up through the undergraduate level and the graduate level can work on a one-on-one basis with the scientist.

This gives them an incentive to go ahead because they can pass it on down the line. We don't have to have middlemen in these programs. Somebody has to have a line item budget for each agency that wants to do this to support each of the students.

I don't think it takes a lot of money, probably a quarter of a million dollars a year per division maybe would take care of about 25 or 30 students a year.

Thank you.

Representative DYMALLY. I regret to inform you that Sir David Stockman eliminated the internship program in the Federal Government.

QUESTION. This is a comment. When you have your regional meetings, I would like to suggest that you consider three different types of groups in that area and focus on them. As we have heard, there are many groups that appeal to this topic and there are other groups that will be protesting the shortage of minorities and women in science and engineering and in other areas.

I think—then there will be a third group that will be developing alternative programs to address these kinds of issues on a continuing basis. Unfortunately, when you have a program and effort like this, there is usually a time lag between the three groups.

One may be proposing something on the left and another one on the right, and so forth. There sometimes appears to be an inconsistency when the overall effort is the same. I suggest that when you do have your regional meetings, to be sure to try to send out the information to all kinds of constituent groups, including churches, local politicians (for suggestions) community leaders, recreation leaders and what have you, so that you can hopefully bring in these three distinct groupings of people, so that when the next wave does come to terms with moneys from the Federal Government or whatever, it will be a unified approach to solving that problem.

My name is Kenneth Hill. I'm from Detroit.

Representative DYMALLY. We will take one more.

QUESTION. My name is John Thompson. I'm very pleased to be here today. I am wearing two hats today. I am with Aberdeen Proving Grounds as a research biologist.

Second, I'm a member of the National Technical Association. We are sometimes referred to as NTA. It just so happens that we, our organization, did not receive an invitation. It just so happens I got it through my organization where I work.

I would like to make a comment that our organization, NTA, has and still is doing work in the areas where some of the panels have referred to. I would like to make a comment in terms of what Dr. Chavis said.

We have a chapter in Baltimore—as a matter of fact, we have 30 professional chapters throughout the United States. At the chapter which I belong to in Baltimore, we have a program where we are working with the church. I feel that the whole problem here in terms of science and technology is that we have forgotten where we come from, where our roots are; that is, within the church.

So we have started working with the church. We are having a program, as a matter of fact, next week, where the minister of this particular church, Reverend Henderson, has invited the NTA, Morgan State University, and another organization we are working together with to apprise the community of science and technology and how it affects them.

I think a lot of people are not aware of how science is affecting them. Until we can let the people know what we are all about, then I think that we won't accomplish anything. To me, I think that's important.

Second, we are inviting all the young people to come. I tell you all here today that our organization is multidisciplined. We have architects, engineers, physicists, chemists, you name it.

And the head of the physics department at Morgan State University has helped us in terms of giving out circulars or flyers to his students and other departmental heads in the sciences to come to this activity which we are having.

We are trying to let the community be aware that they are just as much a part of science and technology as we are ourselves among our peers. So this is a comment which I would like to make.

Representative DYMALLY. Thank you very much.

QUESTION. The one question that I did not hear addressed in today's panel, and maybe it can be addressed at a future seminar, is what can be done about overcommitment? In today's discussions, there were calls for people to serve on study groups, to be involved with legislature, and to do all sorts of things.

We still have to teach and we still have to do research. How can we do all of these things in one lifetime?

Representative DYMALLY. We have three people who wish to speak, four, five, six, seven. [Laughter.]

Dr. Haynes?

QUESTION. I am Dr. Haynes. I shall be brief, but I did want to say before the conference ended that I was somewhat disappointed when I heard people say, "What happens after this conference?"

We come here and talk. There were so many pearls that were dropped here today that if we pick those pearls up and started to do some of the things we heard today, the conference would be very, very successful.

I am unwilling to wait until it gets out into the field. There were some suggestions made here today, for example, that we ought to support the existing institutions, those who are doing what they are doing right now should be encouraged to do so.

A question was raised about competition among the various institutions. I am not sure that that was fully picked up, but I would be very happy if instead of competing with each other, we form some collaborative efforts.

The schools of engineering and the schools of medicine should get together and submit proposals on bioengineering. Things of that kind can move us along.

I commend our Congressman for having this conference. I hope that the pearls which were dropped will be picked up and used, even before we get to the field.

Representative DYMALLY. Thank you very much.

QUESTION. I have a resolution here that I have hastily put together that I hope reflects the sentiments of most of us present. L. C. McMillan.

In recognition of the need to respond to the need for a national affirmative action plan that will increase the number of minority youth entering the sciences and technological fields, to bring together the prestige, influence, and resources of concerned national organizations, business and industry, Government educators and interested citizens, in a concerted effort to correct this national imbalance; to simplify and cut any unnecessary administrative costs of such a plan by tying in with established programs that make the time, funds, and energy invested directly productive; to identify and give public recognition to minority high school students whose records of achievement have demonstrated their potential for positive accomplishment in the sciences and technological field through their personal scholarship, as well as through their influence on other intellectually talented minority youth; to help insure that these able and highly motivated students obtain the opportunity for higher education in the sciences or technological field of their choice and in the institution of their choice, rather than being victims of an education for which they can pay instead of one for which they qualify to provide a means through which secondary schools can be assisted in stimulating the intellectually talented youth; be it resolved that Congressman Dymally and the Black Caucus be thanked for and encouraged to continue such seminars until positive results can be measured.

Representative DYMALLY. You heard the motion. All those in favor, say aye.

[Chorus of ayes.]

Representative DYMALLY. Opposed?

[No response.]

Representative DYMALLY. That's the way they do in Congress. Thank you very much. It's very kind of you.

QUESTION. I appreciate the opportunity. My name is Jim Hayes. I work for Chesapeake Division of the Navy.

I believe Dr. Ely made it loud and clear for the Navy that we have good programs, good EEO. We have upward mobility and the whole thing.

I also am with the National Society of Professional Engineers. I have some information I think might be worth thinking about here. The National Society of Professional Engineers has a policy here, and I would just like to read it.

It says:

> It is the policy of the National Society of Professional Engineers that NSPE is committed to provide programs, update policies, and modify activities to assure the availability of opportunities within the engineering profession for minorities and for women.
>
> NSPE believes that societal prejudicies should not be allowed to influence professional practices. NSPE pledges to work actively for the recruitment, utilization, and encouragement of minorities and women in the engineering profession.

Now, each State has their own organization within the national society, and I live in Maryland and I belong to the Maryland society. And I happen to be in the largest chapter. In fact, I'm the past president of the largest chapter in the Maryland society, the Potomac chapter. We cover all of Prince Georges and Montgomery County.

Now, the society as a whole, including the States and the chapters, have been trying to increase our membership with minorities. We have been fairly successful with women. We haven't been too successful with the others.

I would like to give you my telephone number, which is 433–2515, and those of you that would like to join us, we certainly welcome you.

Thank you, sir.

Representative DYMALLY. Thank you very much.

QUESTION. Thank you. I am Gloria Gardner, with the U.S. Geological Survey.

I would like to commend you for having this program today. While our agency has made progress in the areas of minorities and women in the Earth sciences, there are systemic barriers in most agencies and particularly in scientific agencies that prevent minority and women's participation fully in the processes.

As chair of the minority women's task force out of OPM, we are looking for role models in the areas of science and engineering to work with students in the schools in the metropolitan area.

If any of you are interested in serving as a role model or mentor, please contact me at 860–6384. Thank you.

Representative DYMALLY. Thank you very much. Our final questioner.

QUESTION. I am from the Office of Opportunities in Science at the AAAS, the Association for the Advancement of Science.

We are establishing a network of organizations that work for and represent minority scientists, engineers, and health professionals in an information clearinghouse, the main purpose of which is to make sure that organizations that share goals in this area of increasing the participation of minorities and women and handicapped people in our office are aware of the programs and successes and resources of other organizations that share their goals.

And we would like for any groups or individuals that are not affiliated with a group, particularly, to let us know if you would like to be part of this communication network and have access to the information.

We will be publishing a newsletter and will be participating in the meetings of the organizations that are a part of the network. We will be probably convening some meetings of our own. We have one scheduled now for January 4 in conjunction with the AAAS annual meeting, which is being held here in Washington.

Representative DYMALLY. Thank you very much. Let me thank all of you. Shall we give a round of applause to our stenographer?

[Applause.]

Representative DYMALLY. One final comment.

QUESTION. I noticed that there have not been a tremendously large number of comments from women in the audience. But there are a couple of observations that I would like to make, particularly about some of the Government programs for graduate students.

I am from a black institution with a Ph. D. program in physics. My name is Anna Copland. I am from Howard University.

We also have a program in geology. I think we are the only black institution with a program in geology. One of the difficulties that we find from past experience with Government agencies or industries that accept students for summer employment or for working on advanced degrees is that once that student has gone, the department gets no benefit out of it.

You get the benefit of the student who is there, and perhaps in recruiting students later on. But we don't get any lasting benefit for the long-range program of the department in terms of equipment, and things of this sort, which is part of the difficulty that minority institutions have, particularly in the sciences.

The other thing is that most of the minority institutions do not realize the type of monetary commitment that is necessary for just simply surviving in a science department. It is very difficult for the teachers and the heads of departments to really express that to an administrator.

Now, the other point that I wanted to make is in the whole matter of what will be forthcoming? Will there be anything forthcoming from the legislature? What we are returning to is the so-called pre-Sputnik era in terms of science literacy.

We are losing most of the programs that grew out of the 1959 through 1968 series. So that what's happening is we are now being faced with a situation where students are coming into college much more poorly prepared than they were even then.

We talk about how poorly prepared they were in 1960. But in 1980, they are even worse prepared. We have not really touched on reaching large populations with just adequate numerical computation skills.

We need to get down to talk on the local level about science simply as a means of living, and surviving as a population, that is one thing.

But now to have to go back and produce for the general population programs that will just bring the math level up to what it was in that time is going to be an awful task. It will make us wonder what we did in those 20 years.

Representative DYMALLY. Thank you very much.

We have noted with some interest some suggestions for improvements. Let me assure you we have taken great care to have a stenographer here so that your suggestions would be seriously considered.

You are dealing with a very young staff who put this conference together, a freshman who has no background in science or technology. He's a politician by profession.

And so, thanks to the AAAS and Mr. Thompson from the NSF, and the rest of you. I express how deeply grateful we are for your involvement, your attention, and your presence here.

Thank you and God bless.

[Applause.]

[Whereupon, at 4:50 p.m., the meeting was adjourned.]

○